

# **Integrated Resource Plan**

T V A ' S   E N V I R O N M E N T A L   A N D   E N E R G Y   F U T U R E

Stakeholder Review Group  
Working Session

December 15, 2010  
Chattanooga, TN 2010



10:00-10:15	Introduction	Randy McAdams
10:15-10:40	Update on Natural Resource Plan	Michael Anckner Helen Rucker
10:40-11:00	Final Summary of Public Comments	Chuck Nicholson
11:00-11:45	Preliminary Results from Ongoing Analysis – Part 1	Gary Brinkworth
11:45-12:00	Open Discussion	
12:00-1:00	Lunch	
1:00-2:30	Preliminary Results from Ongoing Analysis – Part 2	Gary Brinkworth
2:30-2:45	Break	
2:45-3:15	Open Discussion	
3:15-3:30	Wrap-Up	Randy McAdams



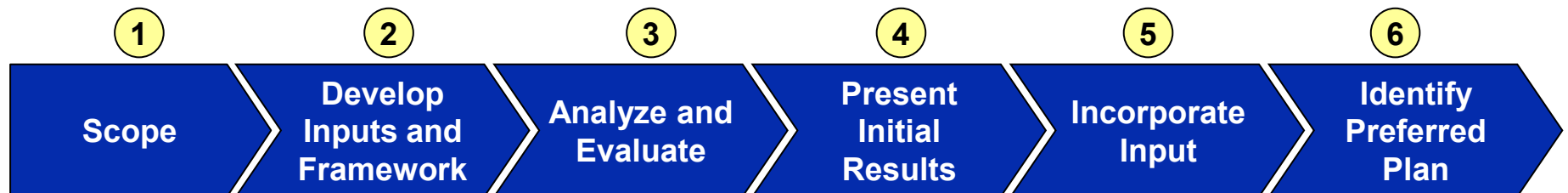
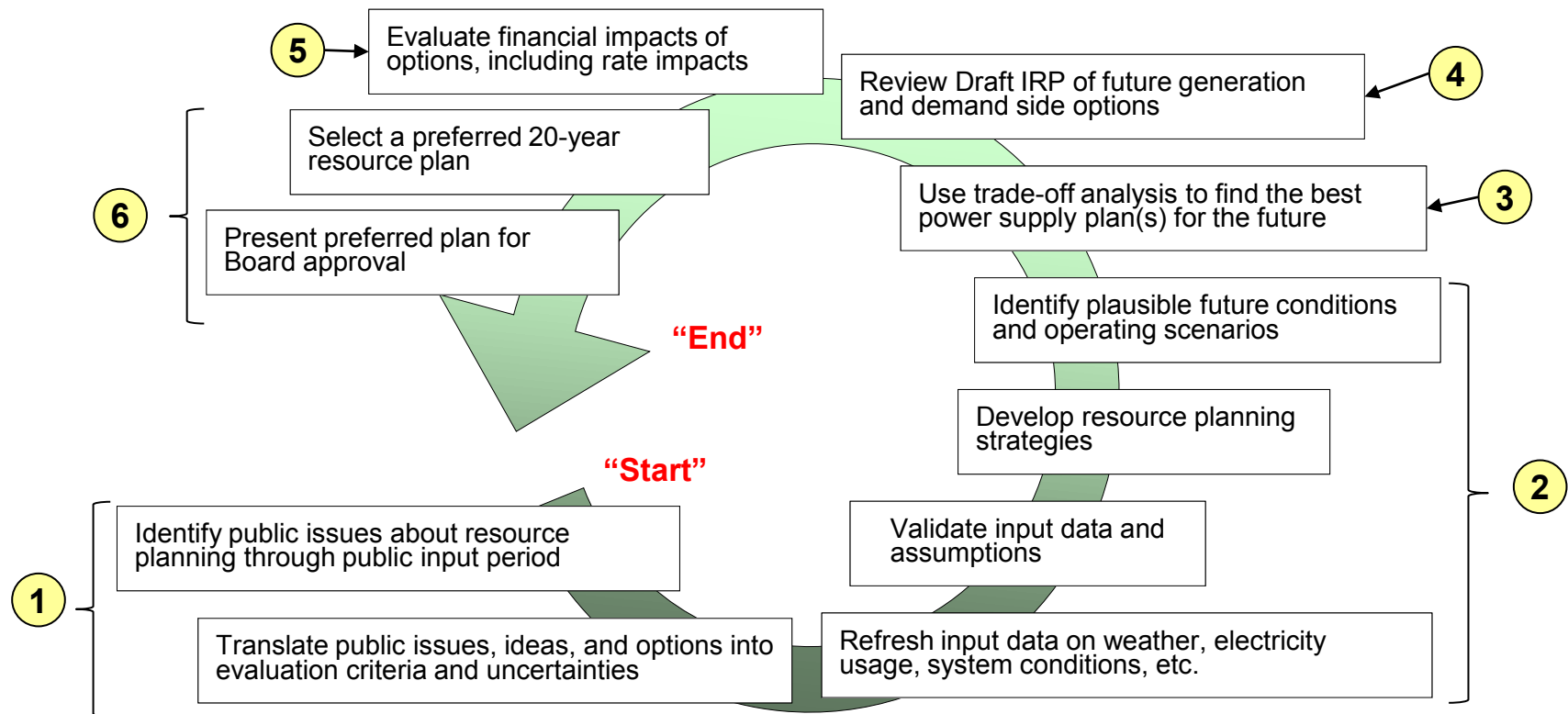
## SRG Purpose

- ◆ Provide TVA with in-depth ongoing discussion and input from different stakeholder viewpoints
- ◆ Serve as a source of information, a coordination mechanism, and a professional review group
- ◆ Build efficiency into the study process by providing real-time public input to IRP issues and processes
- ◆ Validate the various steps in the IRP process

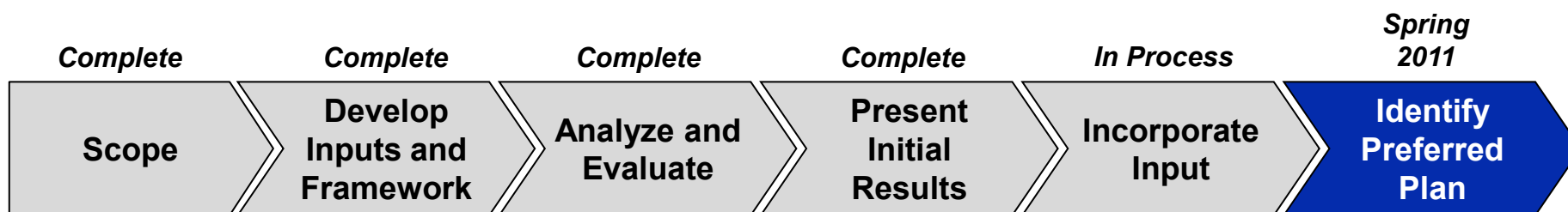
## SRG Meeting Types

- ◆ *Working Sessions* – regular meetings that are not open to the general public
- ◆ *Workshops* – the SRG, by majority vote, can request TVA hold additional “workshops” to provide more in-depth information on specific topics to those members who are interested in attending
- ◆ *Public Comment Sessions* – by majority vote, the SRG may host a public comment session to receive input on specific topics

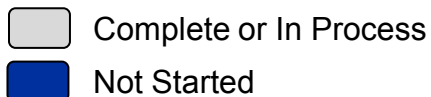
The IRP process that has been previously shared can be summarized into six high-level steps



The SRG has reviewed and provided input on the following topics:



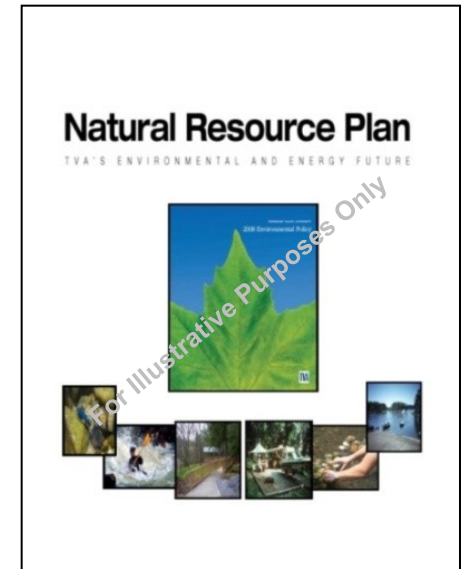
- ◆ Planning process
- ◆ Key uncertainties
- ◆ Updated scenario/worlds
- ◆ Demand-side resource options
- ◆ Supply-side resource options
- ◆ Busbar screening results for supply-side resource options
- ◆ Load forecast
- ◆ Environmental outlook
- ◆ Commodity price forecasts
- ◆ Financial parameters
- ◆ Energy efficiency and demand response
- ◆ Planning strategies
- ◆ IRP scorecard and evaluation metrics
- ◆ Preliminary model results





# NRP Overview: NRP Document Overview

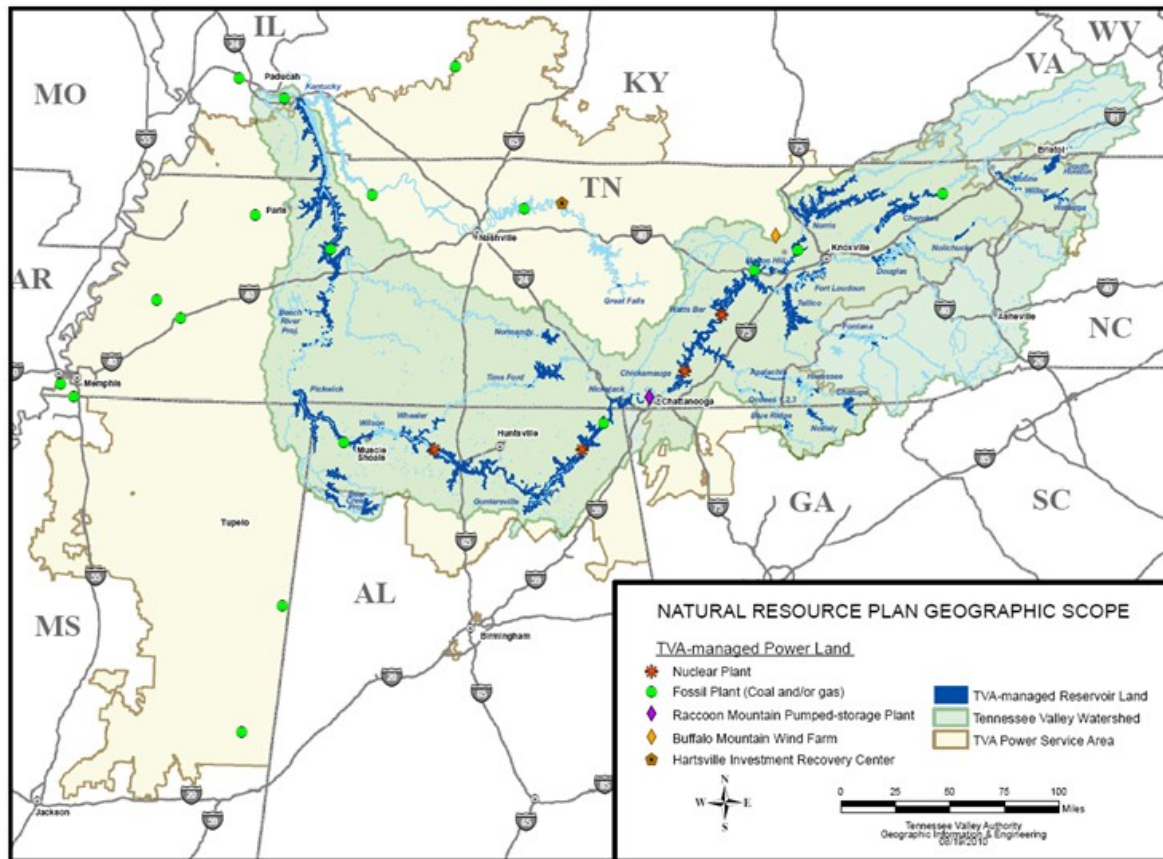
- ◆ The NRP is a strategic framework to guide future decisions by TVA in the areas of water resources, biological and cultural resources, recreation and reservoir lands planning
  - It is 20-year that will be refreshed within the next 5 years
  
- ◆ The NRP will focus on four resource areas:
  - Biological and Cultural Resource Management
  - Recreation Management
  - Reservoir Lands Planning
  - Water Resource Management
  
- ◆ It will evaluate a broad range of resource alternatives through the use of scenario planning
  
- ◆ The NRP will be published with its own accompanying EIS



*\*The summary document is a high level (10 – 20 page) synopsis of the recommended plan*



- ◆ Below is a map of the Tennessee River watershed and TVA power service area



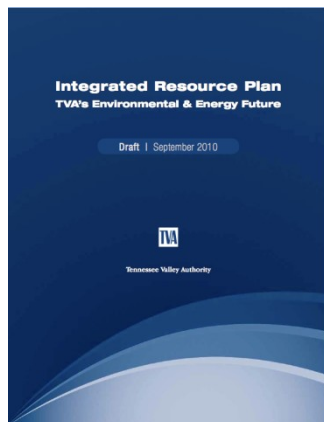
## Key NRP Facts

- ◆ Covers nearly all TVA lands across the Valley
- ◆ Includes reservoir lands planning for TVA-managed reservoirs only
- ◆ Includes water resource management for the entire Tennessee River watershed
- ◆ Does not include transmission properties, mineral holdings, or secured land at nuclear sites

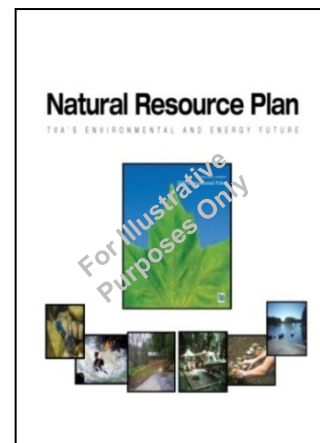


# NRP Overview: IRP vs. NRP

## IRP



## NRP



### Focus

Power Portfolio

Natural Programs, Water Resources,  
Recreation, Lands Planning

### Time Horizon

20 Years

20 Years

### Planning Methodology

Scenario Planning

Scenario Planning

### Publication Date

Draft: September 2010  
Final: March 2011

Draft: February 2011  
Final: Summer 2011



## NRP Overview: Environmental Policy Coverage

The IRP and NRP provide coverage for most elements of the Environmental Policy

- ◆ There is limited mention of Waste Minimization in either document, but it is covered through the Sustainability Plan
- ◆ Sustainable reduction of consumptive water use is addressed in the 2004 Reservoir Operations Study (ROS)<sup>1</sup>

Environmental Policy Objective	Coverage			
	IRP	NRP	ROS	Sustainability Plan
Climate Change Mitigation	✓			
Air Quality Improvement	✓			
Water Resource Protection & Improvement	✓	✓	✓	
Waste Minimization	✓			✓
Sustainable Land Use	✓	✓		
Natural Resource Management		✓	✓	

1 - [http://www.tva.gov/environment/reports/ros\\_eis/ros\\_rod.pdf](http://www.tva.gov/environment/reports/ros_eis/ros_rod.pdf)



# NRP Overview: Scenario Planning Inputs

Scenario planning marries together various perspectives and analysis to provide management with the best NRP program portfolio mixes to select the final NRP strategy

## Program Options

Program	Element	Goal / Activity	Management Options			
			Current Mgmt	Custodial Mgmt	Enhanced Mgmt	Flagship Mgmt
Water Resource Improvement Programs	Water Resource Improvement Campaigns	Reduce tons of suspended sediment reaching streams per year		720	1080	360
		Reduce pounds of phosphorus reaching streams per year		1100	1650	550
	Targeted Reservoir Initiative Program	Develop a watershed aquatic improvement plan				
		Reduce 5000 pounds of phosphorus reaching a TVA-managed reservoir per year				5000
	Targeted Watershed Initiative Program	Reduce tons of suspended sediment reaching streams per year	234			1300
		Reduce pounds of phosphorus reaching streams per year	350			2200
	Water Resource Grant Program	Deliver watershed products per year	50			75
		improve # of HUCs per n years	1 (5 years)			1 (3 years)
	Quality Growth Program	Develop and implement evaluation, management, and conservation processes				
		Deliver communicative products including awards, and/or conferences per year	25			
Aquatic Monitoring and Management	Reservoir Shoreline Stabilization / Riparian Management	Stabilize miles of critical riparian shoreline per year				
		Partner and actively participate with the aquatic biological communities			3	8
		Develop and evaluate public outreach opportunities to raise public awareness (consistent with EO 13112)				
		Conduct stream assessments per year				
Stream and Tailwater Monitoring Program		Share stream and reservoir data (method varies by management option) *	as requested	as requested	online	online data (interactive)

## Cost Analysis

Program	Element	Current		Custodial		Enhanced		Flagship	
		FTE	Total Cost	FTE	Total Cost	FTE	Total Cost	FTE	Total Cost
Water Resource Improvement Programs	Water Resource Improvement Campaigns	0.00	\$ -	0.00	\$ 1,300,000	0.00	\$ 1,300,000	0.00	\$ 4,300,000
	Targeted Reservoir Initiative Program	0.00	\$ -	0.00	\$ -	0.00	\$ -	0.00	\$ 3,600,000
	Targeted Watershed Initiative Program	1.00	\$ 1,074,000	0.00	\$ -	0.00	\$ -	0.00	\$ 2,517,000
	Water Resource Grant Program	0.00	\$ -	0.00	\$ -	0.00	\$ -	0.00	\$ 250,000
	Quality Growth Program	1.00	\$ 263,000	0.00	\$ -	0.00	\$ -	0.00	\$ -
	Reservoir Shoreline Stabilization / Riparian Management	0.00	\$ -	0.00	\$ -	1.00	\$ 661,000	3.00	\$ 1,888,000
	Total FTE and Costs - Water Resource Improvement Programs	0.00	\$ 1,307,000	0.00	\$ 1,300,000	7.00	\$ 2,792,000	12.00	\$ 8,231,000
Aquatic Monitoring and Management	Aquatic Ecology Management	0.00	\$ -	0.00	\$ -	1.00	\$ 263,000	1.00	\$ 263,000
	Stream and Tailwater Monitoring Program	1.00	\$ 213,000	0.00	\$ -	1.00	\$ 168,000	2.00	\$ 337,000
Partnership Program	Total FTE and Costs - Aquatic Monitoring and Management	1.00	\$ 213,000	0.00	\$ 167,000	2.00	\$ 422,000	3.00	\$ 590,000
	Strategic Partnership Program	0.00	\$ -	0.00	\$ -	1.00	\$ 263,000	1.00	\$ 263,000
Public Outreach	Partnership Program	0.00	\$ -	0.00	\$ -	1.00	\$ 263,000	1.00	\$ 263,000
	Total FTE and Costs - Partnership Programs	0.00	\$ -	0.00	\$ -	2.00	\$ 526,000	2.00	\$ 526,000
Public Outreach	Strategic Partnership Program	0.00	\$ -	0.00	\$ -	1.00	\$ 263,000	1.00	\$ 263,000
	Water Efficiency Program	0.00	\$ -	0.00	\$ -	0.00	\$ -	0.00	\$ -
	Water Resource Outreach Campaign	0.00	\$ -	0.00	\$ -	0.00	\$ -	0.00	\$ -
	Total FTE and Costs - Public Outreach	0.00	\$ -	0.00	\$ -	0.00	\$ -	0.00	\$ -
	Total FTE and Costs - All Programs	2.00	\$ 1,520,000	0.00	\$ 1,467,000	10.00	\$ 4,183,000	17.00	\$ 10,147,000

## Scenario Planning Matrix

Planning Strategies	Scenarios				Total Score (by scenario)
	Economy Recovers Dramatically	Environmental Focus is a National Priority	Prolonged Economic Malaise	Carbon Legislation Creates Economic Downturn	
Resource conservation					
Recreation focus					
Balanced management					

## Natural Resource Economics Benefit Analysis

<p>Shaping the Future</p> <p>Table 10: Summary of Benefits of Cultural Resource Program Benefits Under Enhance - water resource option</p>					
Cultural Resource Programs	Recreation / Visitor Use Benefit	Water Resource Benefit	Species / Habitat Conservation Benefit	Management Data and Resource Data Benefit	Public Perception, Outreach, Outreach
ARPA	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.
Archaeological Research and Protection	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.
Corporate History Program	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.	Projected 2.0 million dollars in additional revenue from 2010 to 2030. This revenue is projected to be used for the maintenance and improvement of the park's infrastructure and facilities.

## Benefit Weighting Exercise

Environmental Stewardship Metric	Metric Weights		
	Conservation	Recreation	Balanced
Recreation/ Visitor Benefit Use	1%	44%	17%
Water Resource Benefit	9%	24%	17%
Species/ Habitat Conservation and Abundance	1%	10%	17%
Cultural Resource Preservation	40%	1%	17%
Management Data and Scientific Knowledge/ Reduce Compliance Costs	5%	1%	16%
Public Perception, Partnerships, Outreach	5%	20%	16%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

## Program Highlights: Land Conditions Assessment (LCA)

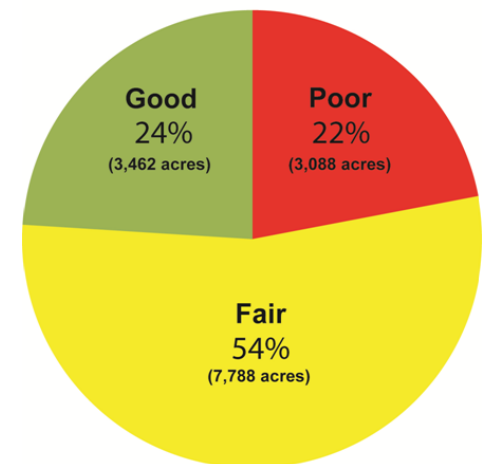
A proactive, responsible, and systematic stewardship approach for natural resource management



- ◆ LCA methodology was developed in FY09 by TVA Natural Resource Professionals to determine whether individual parcels of land meet desired conditions

- ◆ Assessments are conducted on reservoir properties (Zones 3 and 4)
- ◆ Two person teams of natural resource professionals evaluate thirteen specific conditions that fall under four resource management categories
- ◆ A comprehensive assessment is made of each parcel and an overall parcel rating of “Good”, “Fair”, or “Poor” is given via TVA’s Land Conditions Indicator
- ◆ The LCA is a leading practice in the industry, many successes have been realized, and other federal agencies are expressed interest in similar assessments

Condition of 14,338 Acres  
Assessed in FY09-10



# TVA Clean Campground Demonstration Site

**TVA's Melton Hill Lake will be the first green recreation demonstration site**



- ◆ Demonstrates how renewable energy, energy efficiency measures, water conservation, and recycled products of coal combustion can be integrated into a clean and green campground
- ◆ Powered by a wind and solar energy “microgrid” with battery systems for energy storage
- ◆ Reduces energy requirements with passive solar and energy efficiency measures

## Characteristics of the project

- ◆ A fully self-sustained clean-energy recreation site and a net-zero energy campground
- ◆ Water conservation techniques will be explored (e.g., low-flow showers and rain/grey water collection)
- ◆ The potential for charging electric vehicles will be evaluated

***Once the test phase is complete, results will be made public to encourage green campground development***



## Program Highlights: TVA Clean Marina Initiative

**A voluntary program developed to promote environmentally responsible marina and boating practices**



- ◆ Designed as an ongoing program to reduce water pollution and erosion in the Tennessee River watershed
- ◆ Certifies marinas are in compliance with pollution-control standards
- ◆ Encourages boater education, communication of existing laws, as well as offer incentives for creative and proactive marina operators
- ◆ Focuses on seven management measures:
  - Sewage management
  - Fuel management
  - Solid waste and petroleum recycling/disposal
  - Vessel operation, maintenance and repair
  - Marina siting, design, and maintenance
  - Storm water management and erosion control
  - Public education



## Additional Information

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**For more information on the Environmental Impact Statement, contact:**

Heather L. Montgomery  
National Environmental Policy Act Specialist  
Tennessee Valley Authority  
Post Office Box 1010, CTR 2W  
Muscle Shoals, AL 35662-1010 (256) 386-3803  
  
NRP@tva.gov

**Or visit the NRP website at:**  
**<http://www.tva.gov/environment/reports/nrp>**





- ◆ The public comment period ended on November 15 and approximately 500 comments were received

Method of Comment	Number Received
E-mail	45
Online comment form	80
Webinar comment/question from IRP Briefings	15
Oral comment/question from IRP Briefings	40
Letters	20
Form letters (pre-printed post cards) <sup>A,B</sup>	300
Total	500

- ◆ Organizations and agencies which commented include:

- Environmental Protection Agency
- Southern Alliance for Clean Energy
- Sierra Club
- Earth Justice
- Tennessee Valley Public Power Assoc.
- Natural Resources Defense Council
- Distributors
- State agencies
- Industry groups, (e.g. solar, energy associations, natural gas, etc.)

A – TVA received 300 post cards with pre-printed comments. Senders signed their name, but did not provide any additional comments beyond the standard text

B – One of four unique comments is included on each postcard:

- 1) Maximize economic development of the Valley through creation of clean energy jobs by developing EE and renewable energy resources
- 2) Minimize TVA's impact on climate change, particularly by developing the Valley's EE and renewable energy resources
- 3) Make TVA a national leader in EE with at least 1% per year reductions in energy demand and a serious commitment to developing the Valley's solar, wind, and bioenergy resources
- 4) Minimizes the amount of nuclear power used to meet future energy demand

## Common themes emerged from the comments received

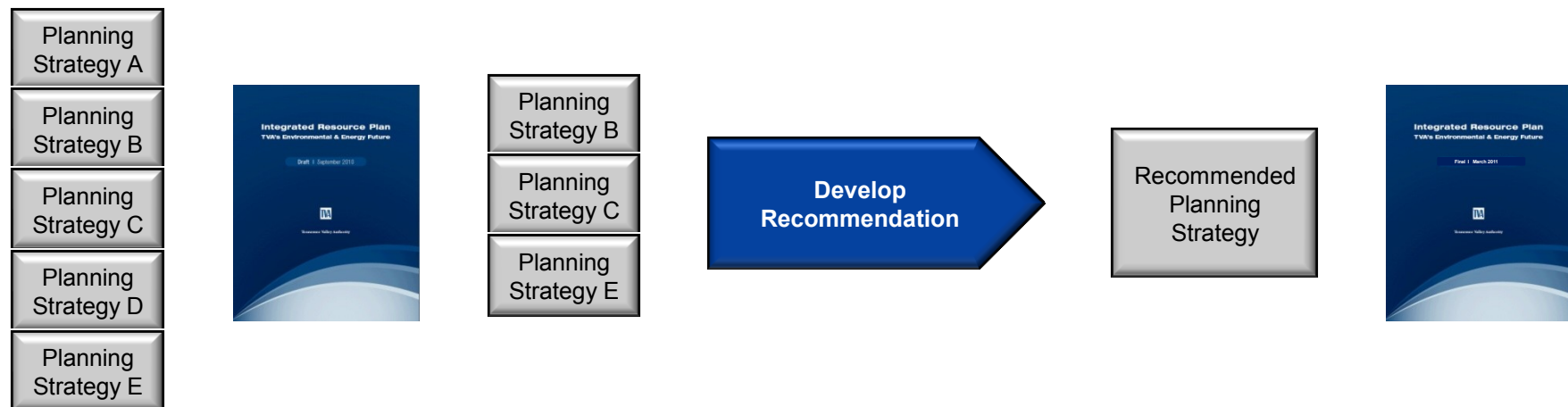
Topic	Comments
Fossil capacity idling strategy	<ul style="list-style-type: none"> <li>– People commended TVA on the fossil capacity idling strategy</li> <li>– Some public briefing attendees felt that larger quantities of idled capacity should be considered</li> </ul>
Renewable additions	<ul style="list-style-type: none"> <li>– Some people were pleased with the renewable recognition in the Draft IRP as long as costs were competitive</li> <li>– Others expressed support for greater in-valley options (particularly solar)</li> </ul>
Nuclear additions	<ul style="list-style-type: none"> <li>– Some comments applauded TVA for adding nuclear in a cost effective, responsible way</li> <li>– Others expressed concerns over rising costs and nuclear waste issues related to additions to the nuclear portfolio</li> </ul>
Energy efficiency and demand response	<ul style="list-style-type: none"> <li>– Some comments wanted to see greater incentives and more focus on EE/DR in the IRP</li> <li>– Others were pleased with the contribution of EE/DR in the planning strategies retained in the Draft IRP</li> </ul>
Energy storage	<ul style="list-style-type: none"> <li>– Several comments suggested that energy storage capability should be increased</li> </ul>
Natural gas	<ul style="list-style-type: none"> <li>– Many comments expressed support for additional natural gas-fired generation</li> </ul>

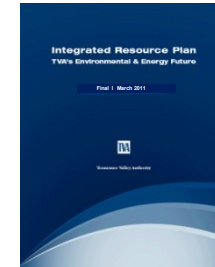
- ◆ All comments are reviewed in detail and synthesized into key points that require a response
- ◆ Comments are logged into a comment management database for tracking purposes
- ◆ Each comment is assigned to the appropriate subject-matter expert and ownership is logged in the comment management system
- ◆ Subject-matter experts evaluate comments, incorporate into their IRP analysis as appropriate, and develop a response
- ◆ Responses are subject to a review process and, once approved, prepared for publication within the Final Environmental Impact Statement (EIS)



# Developing the Recommended Planning Strategy

- ◆ The Draft IRP established a broad range of alternatives by presenting multiple planning strategies
- ◆ Between the Draft and Final IRP, a recommended planning strategy will be developed
- ◆ Ongoing analysis will evaluate attributes from the top three planning strategies retained in the Draft IRP
  - The range of attributes in the retained strategies define the upper and lower bounds for the analysis





- ◆ Incorporate public comments and input
- ◆ Evaluate attributes of retained planning strategies through ongoing analysis
- ◆ Refresh and rescore the ranking and strategic metrics to evaluate new attribute combinations identified in analysis
- ◆ Identify recommended planning strategy through TVA leadership's evaluation of analysis results, stakeholder input, and other considerations
- ◆ Present primary recommendation and alternatives for Board approval

- ◆ The analysis approach between the Draft and Final IRP was modified to incorporate SRG input and increase productivity
  - The revised approach reduced the number of model inputs that were defined prior to model optimization
  - A reduction in defined inputs produces a more comprehensive result
  - A few “one-offs” are still be required to test additional factors
  
- ◆ Portfolios for renewable additions and EE/DR will be optimized in the analysis and not applied as defined model inputs
  - The model will select the best renewable and EE/DR portfolio from the options provided as a part of optimizing all other resource alternatives
  
- ◆ Fossil capacity idled cannot be optimally selected and will require iterations to test all the levels
  - The optimum renewable and EE/DR portfolios will be selected for each level of fossil capacity idled



- ◆ The recommended planning strategy will be subject to constraints as defined by the planning strategies retained in the Draft IRP
  - These constraints are summarized below

Attributes	Constraints
EE/DR	– The EE/DR portfolio will be no less than 2,100 MW & 5,900 annual GWh reductions by 2020
Renewable Additions	– Renewable additions will be no less than the existing wind contracts
Fossil Capacity Idled	– Fossil capacity idled will be between 2,400 MW and 4,700 MW
Energy Storage	– The pumped storage hydro unit (850 MW) will be included in all cases
Nuclear	– Nuclear units cannot be added any earlier than 2018 and large units must be a minimum of two years apart
Coal	– New units cannot be added prior to 2025 and must be equipped with carbon capture and sequestration
Market Purchases and Transmission	– If more than 900 MW are purchased beyond current contracts and extensions, potential transmission costs come into play
Transmission	– Transmission upgrades will be made to support new supply resources and maintain system reliability

- ◆ Attributes from the planning strategies retained in the Draft IRP will be provided to the model for optimization
  - Attribute options are summarized in the following table
  - Fossil capacity idling cannot be optimally selected and will require iterations to test all the levels

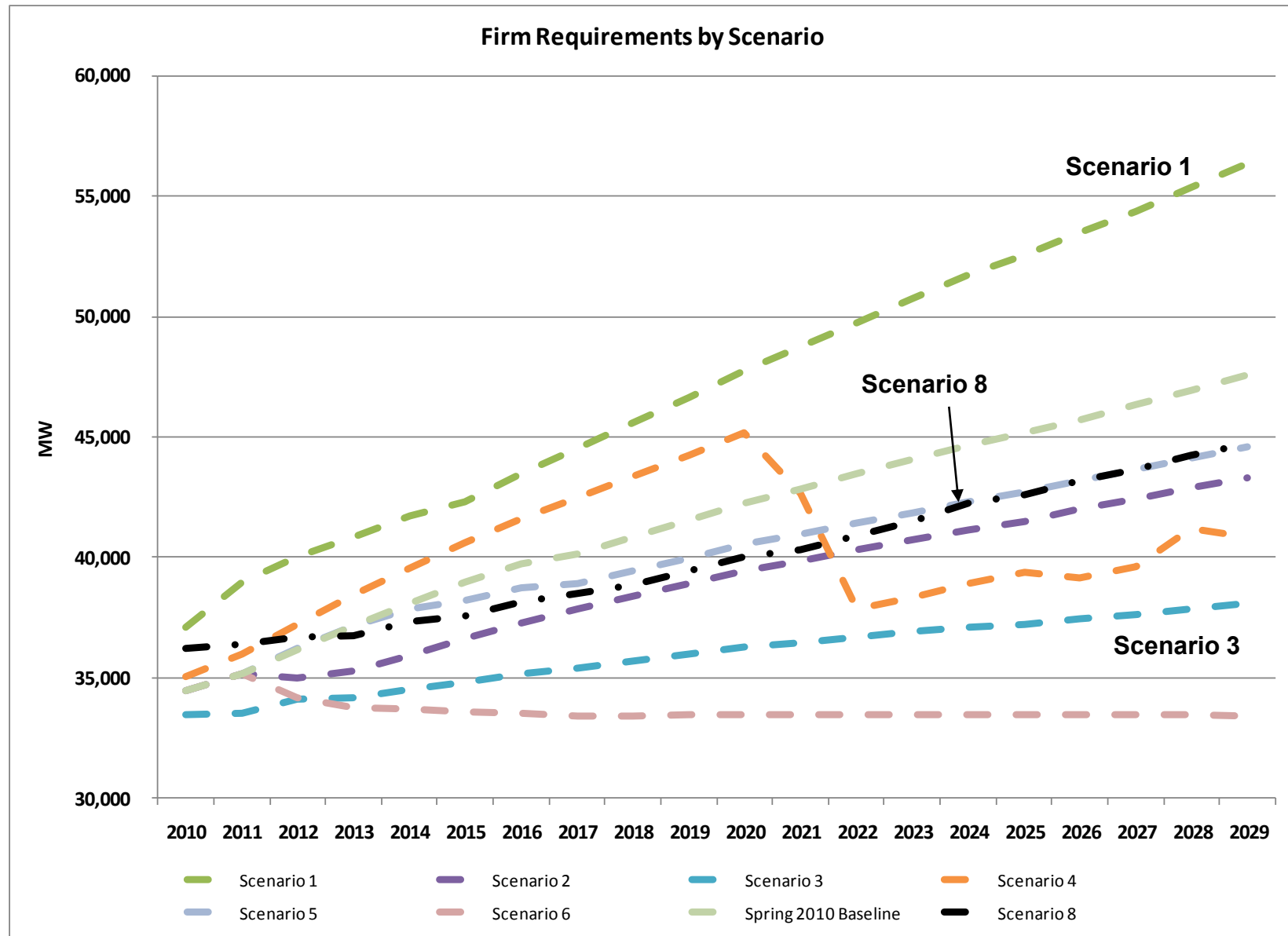
Attributes	Range of Options Tested				
EE/DR	– 2,100 MW & 5,900 annual GWh reductions by 2020		– 3,600 MW & 11,400 annual GWh reductions by 2020		– 5,100 MW & 14,400 annual GWh reductions by 2020
Renewable Additions <sup>1</sup>	– 1,500 MW competitive resources or PPAs by 2020	– 2,500 MW competitive resources or PPAs by 2029	– 2,500 MW competitive resources or PPAs by 2020	– 3,500 MW competitive resources or PPAs by 2029	– 3,500 MW competitive resources or PPAs by 2020
Fossil Capacity Idled	– 2,400 MW total fleet reductions by 2017	– 3,200 MW total fleet reductions by 2017	– 4,000 MW total fleet reductions by 2017	– 4,700 MW total fleet reductions by 2017	

- ◆ Additional sensitivity cases are also being considered in this phase of analysis to evaluate other factors such as an all gas (i.e., no nuclear additions) constraint on capacity additions

<sup>1</sup> – MW values represent nameplate capacity. Net dependable capacity values will be lower

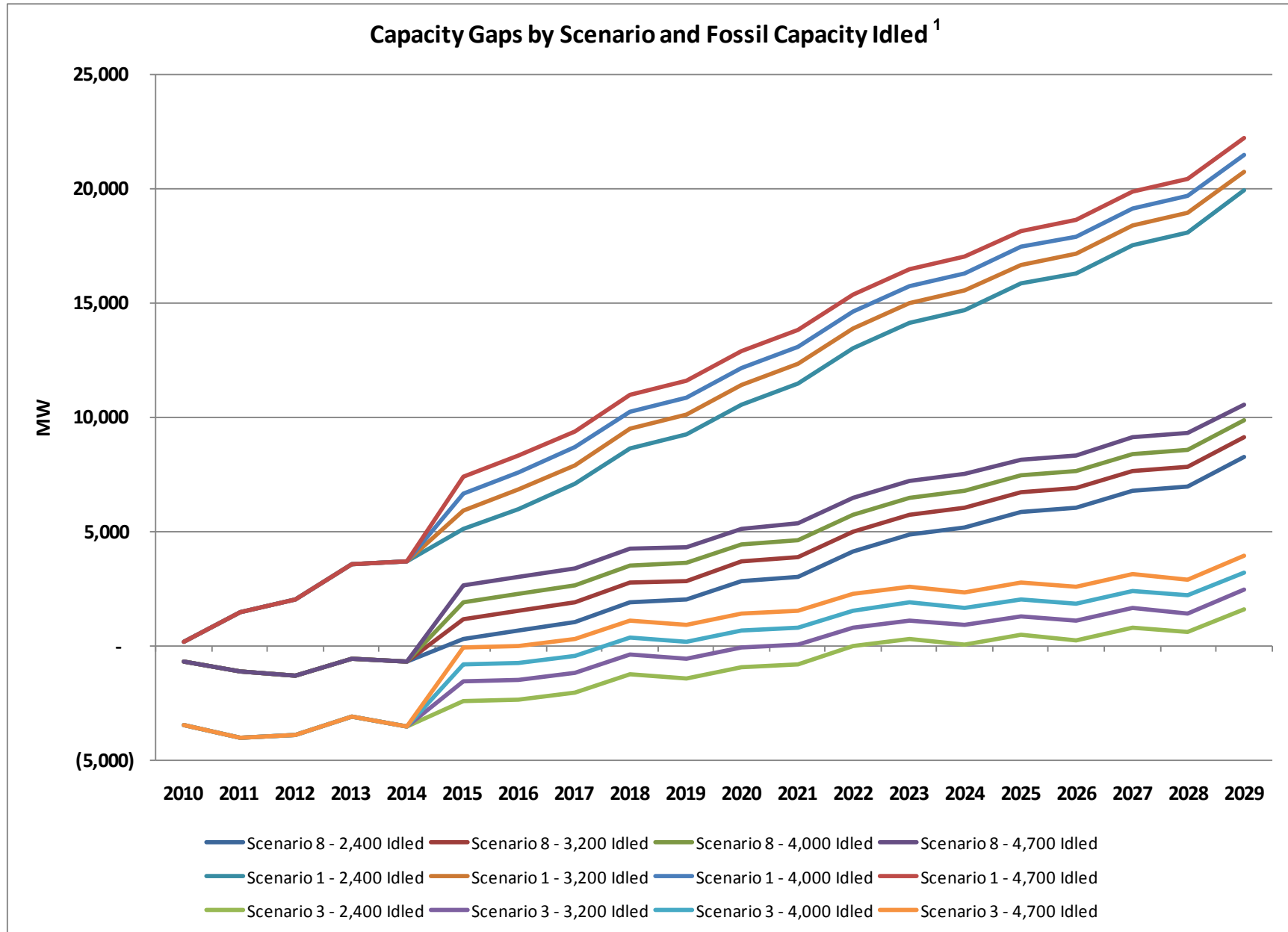
- ◆ Analysis will follow an approach that uses a subset of the scenarios in the Draft IRP for interim evaluation
- ◆ Three scenarios will be used to efficiently test the full range of possible futures
  - Scenario 1 represents the upper bound
  - Scenario 3 is the lower bound and does not include climate change regulation
  - Scenario 8 is the current baseline
- ◆ Interim results will be evaluated using ranking metrics and will be calculated in the same way as the Draft IRP
  - A fully populated scorecard will be completed for the Final IRP
- ◆ The scenario approach optimizes model run time and increases the efficiency of the analysis

# Scenarios Provide a Broad Range of Power Requirements



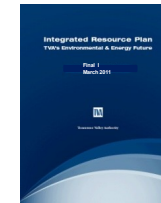
Firm requirements (load forecast – interruptible load + reserve margin)

# Range of Capacity Gaps Considered



1 – Includes Board approved projects (e.g., WBN 2), existing wind contracts, and 2,100 MW EE/DR by 2020

- ◆ Attributes from the planning strategies retained in the Draft IRP establish the boundaries and constraints for optimization



Attributes	Range of Options Tested				
EE/DR	~ 2,100 MW & 5,900 annual GWh reductions by 2020		~ 3,600 MW & 11,400 annual GWh reductions by 2020		~ 5,100 MW & 14,400 annual GWh reductions by 2020
Renewable Additions	~ 1,500 MW competitive resources or PPAs by 2020	~ 2,500 MW competitive resources or PPAs by 2020	~ 2,500 MW competitive resources or PPAs by 2020	~ 3,500 MW competitive resources or PPAs by 2020	~ 3,500 MW competitive resources or PPAs by 2020
Fossil Capacity Idled	~ 2,400 MW total fleet reductions by 2017	~ 3,200 MW total fleet reductions by 2017	~ 4,000 MW total fleet reductions by 2017	~ 4,700 MW total fleet reductions by 2017	

- ◆ Ranking metrics are applied to optimization results to select fossil capacity idled using the same criteria applied in the Draft IRP

- 65% Cost (65% PVRR + 35% Short-term rates)
- 35% Risk (35% Risk / Benefit + 65% Risk)

**Ranking Metric Worksheet**

	Idled Capacity	Scenarios			Total
		Sc 1	Sc 3	Sc 8	
Weighted Ranking	2,400				
	3,200				
	4,000				
	4,700				

- ◆ Other attribute values are selected from the options that frequently appear in the optimization results

**Scenario Matrix**

	Scenarios							
	#1	#2	#3	#4	#5	#6	#7	#8
Optimized Strategy								

- ◆ These results will be used to build a fully populated scorecard with ranking and strategic metrics
- ◆ The completed scorecard will be compared with Draft IRP results to evaluate improvement over previously considered alternatives

**Fully Populated Scorecard**

Scenarios	Ranking Metrics					Strategic Metrics				
	Energy Supply					Environmental Stewardship			Economic Impact	
	Plan Cost	Short-Term Rate Impacts	Risk / Benefit	Risk Exposure	Total Plan Score	CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
1	99.43	99.21	97.82	96.78	98.58	●	●	●	0.8%	0.6%
2	100.00	99.22	99.79	100.00	99.80	●	●	●		
3	99.15	96.03	95.01	97.73	97.72	●	●	●		
4	99.45	99.58	95.32	89.57	96.73	●	●	●		
5	99.83	99.50	98.87	99.47	99.56	●	●	●		
6	99.16	95.61	100.00	100.00	98.64	●	●	●	0.3%	0.2%
Baseline	99.68	99.77	98.98	98.96	99.45	●	●	●		
Total Ranking Metric Score					690.47					

## The role of modeling in the decision process for getting the best solution

Attributes	Range of Options Tested				
EE/DR	~ 2,100 MW & 5,900 annual GWh reductions by 2020		~ 3,600 MW & 11,400 annual GWh reductions by 2020		~ 5,100 MW & 14,400 annual GWh reductions by 2020
Renewable Additions <sup>1</sup>	~ 1,500 MW competitive resources or PPAs by 2020	~ 2,500 MW competitive resources or PPAs by 2029	~ 2,500 MW competitive resources or PPAs by 2020	~ 3,500 MW competitive resources or PPAs by 2029	~ 3,500 MW competitive resources or PPAs by 2020
Fossil Capacity Idled	~ 2,400 MW total fleet reductions by 2017	~ 3,200 MW total fleet reductions by 2017	~ 4,000 MW total fleet reductions by 2017	~ 4,700 MW total fleet reductions by 2017	

*Modeling Results*

*Metrics and Priority*

**Internal/External Stakeholder Input**

**Other Strategic Considerations**

**TVA Leadership**



*Modeling serves as only one input for TVA leadership to consider when selecting the optimal resource portfolio*

**Integrated Resource Plan**





# Preliminary Outcome of Resource Optimization

- ◆ The following five slide shows the resource addition schedules for 12 portfolios
- ◆ Abbreviations are summarized in the following table:

Unit Abbreviation	Name
BLN 1 <sup>1</sup>	Bellefonte Nuclear Unit
CC	Combined Cycle Combustion Turbine (Natural Gas)
CT	Combustion Turbine (Natural Gas) ~800 MW
CTa	Combustion Turbine (Natural Gas) ~600 MW
GL CT Ref	Refurbishment of Combustion Turbine at Gleason
IGCC	Integrated Gasification Combined Cycle (Coal)
JSF CC	John Sevier Combined Cycle
NUC	Nuclear Unit AP1000
PPAs & Acqs	Purchased Power Agreements and Acquisitions
PSH	Pumped Storage Hydro
SCPC	Supercritical Pulverized Coal
WBN 2	Watts Bar Nuclear Unit 2

1 – The number denotes a specific unit number (i.e., BLN2 is a second unit)

# Preliminary Outcome of Resource Optimization (Cont'd)

	Scenario 1 Capacity Additions <sup>1</sup>			
Idled Capacity	2,400	3,200	4,000	4,700
Renewable Portfolio <sup>2,3</sup>	2,500	2,500	2,500	2,500
EE/DR Portfolio <sup>4</sup>	5,074	5,074	5,074	5,074

	Scenario 8 Capacity Additions <sup>1</sup>			
	2,400	3,200	4,000	4,700
	1,500	1,500	1,500	1,500
	3,627	3,627	5,074	5,074

	Scenario 3 Capacity Additions <sup>1</sup>			
	2,400	3,200	4,000	4,700
	1,500	1,500	1,500	1,500
	3,627	3,627	3,627	3,627

2010	PPAs & Acqs	PPAs & Acqs	PPAs & Acqs	PPAs & Acqs
2011				
2012	JSF CC	JSF CC	JSF CC	JSF CC
2013	WBN 2	WBN 2	WBN 2	WBN 2
2014				
2015	GL CT Ref PPAs & Acqs	GL CT Ref PPAs & Acqs	CC GL CT Ref PPAs & Acqs	CC (2) GL CT Ref PPAs & Acqs
2016		CC	CTa	CTa
2017	CC	CTa	CT	CTa
2018	BLN 1	BLN 1	BLN 1	BLN 1
2019				
2020	BLN 2 PSH	BLN 2 PSH	BLN 2 PSH	BLN 2 PSH
2021				
2022	CT CTa	CC CT	CC CT	CC CT
2023	CT	CT	CTa	CT
2024	NUC	NUC	NUC	NUC
2025	IGCC		IGCC	IGCC
2026	NUC	NUC	NUC	NUC
2027	CT	CT	IGCC	IGCC
2028	CT	CT	CT	IGCC CTa
2029	CC	CT IGCC	CT IGCC	IGCC CTa

JSF CC	JSF CC	JSF CC	JSF CC
WBN 2	WBN 2	WBN 2	WBN 2
GL CT Ref	GL CT Ref	GL CT Ref	CC GL CT Ref
BLN 1	BLN 1	BLN 1	
BLN 2 PSH	BLN 2 PSH	BLN 2 PSH	BLN 1 PSH
			BLN 2
	CTa		
CTa	CT	CTa	CTa
CT	CT	CTa	CTa

JSF CC	JSF CC	JSF CC	JSF CC
WBN 2	WBN 2	WBN 2	WBN 2
			CC
PSH	PSH	PSH	PSH

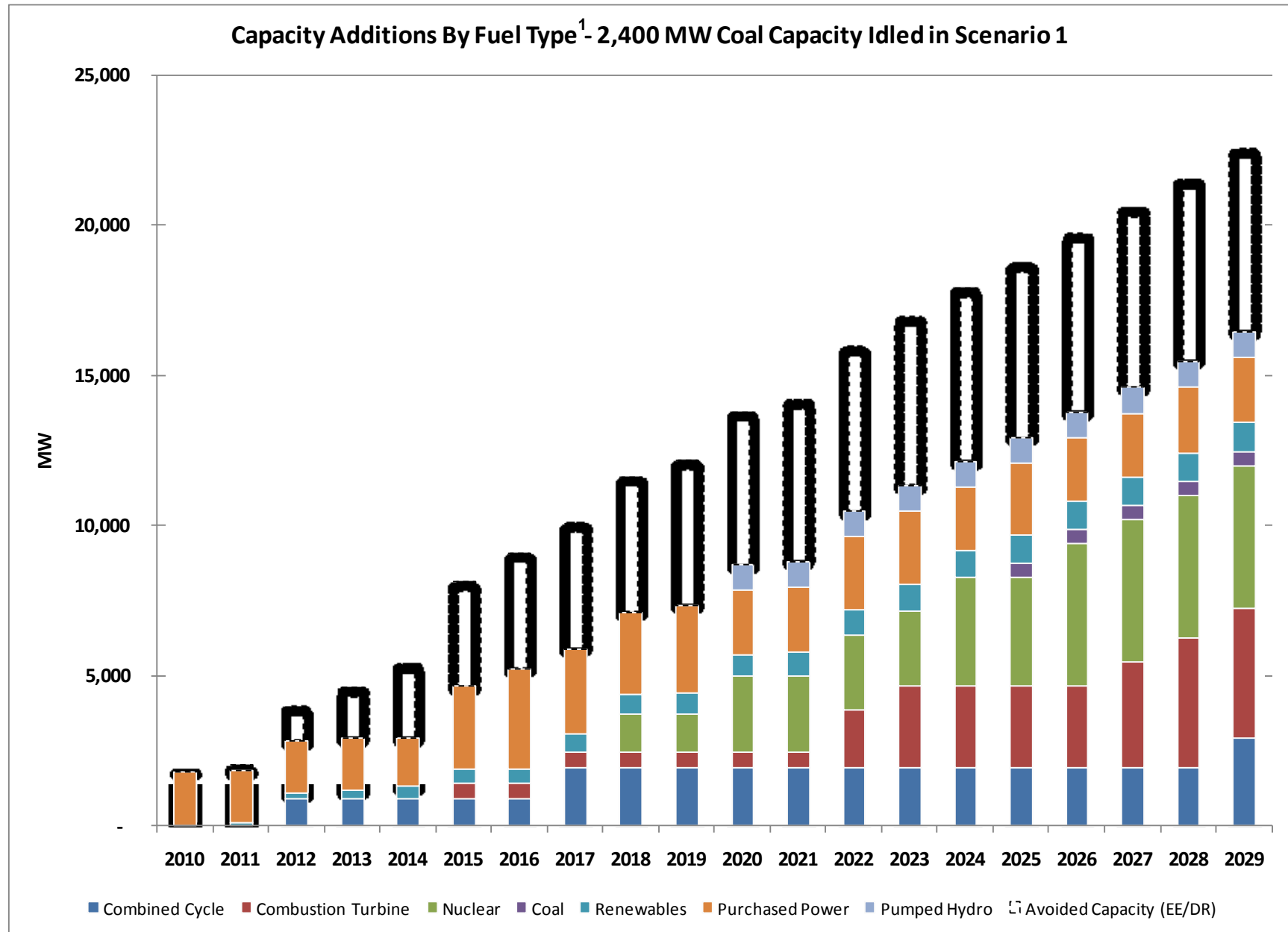
1 – Preliminary results as of 12/13/10

2 – Renewable portfolio values shown are in nameplate capacity. Net dependable values would be lower

3 – MW of capacity additions achieved by 2029

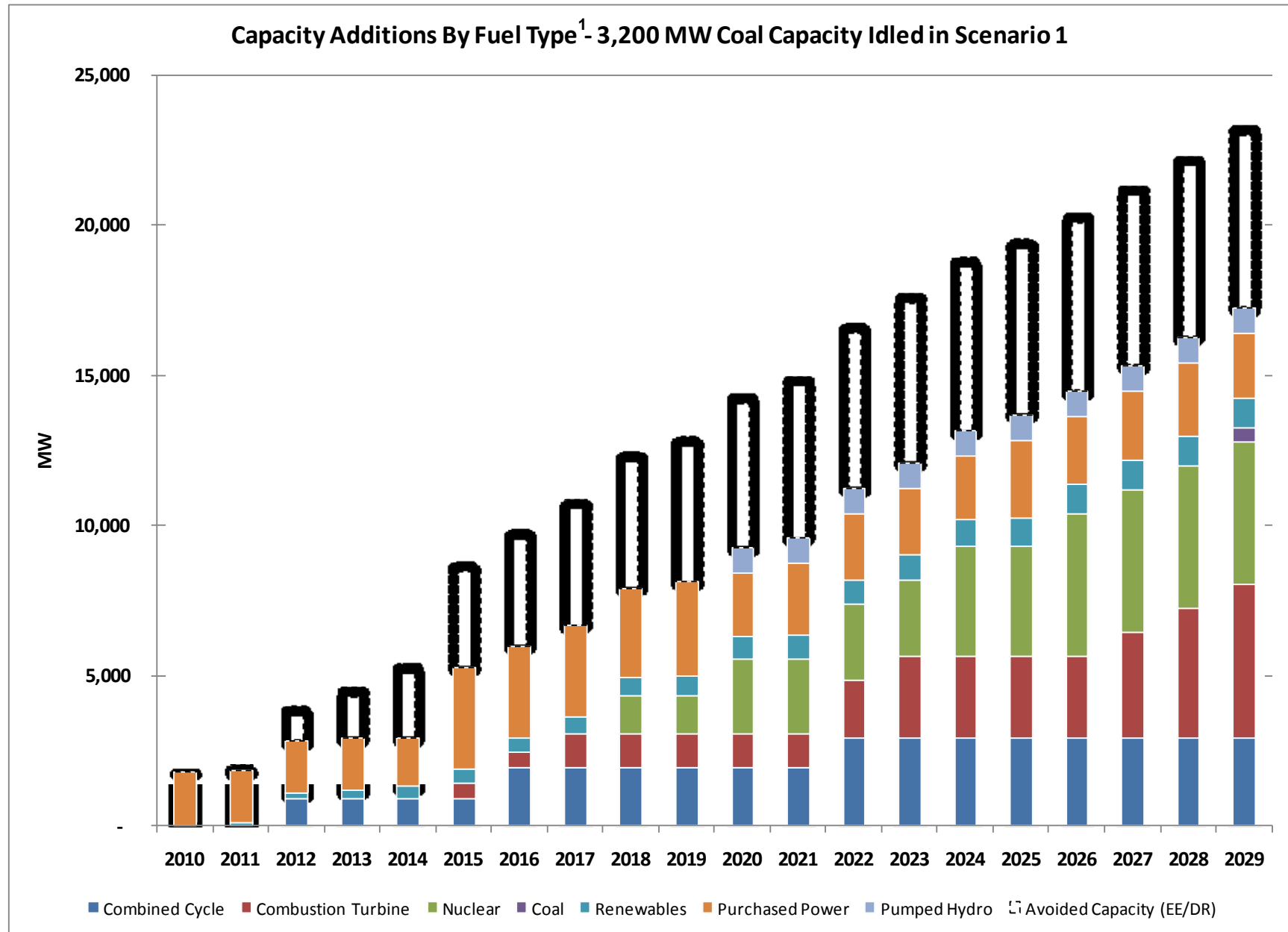
4 – Selected portfolio is represented by demand reduction achieved (MW) by 2020

# Capacity Additions by Fuel Type (Cont'd)



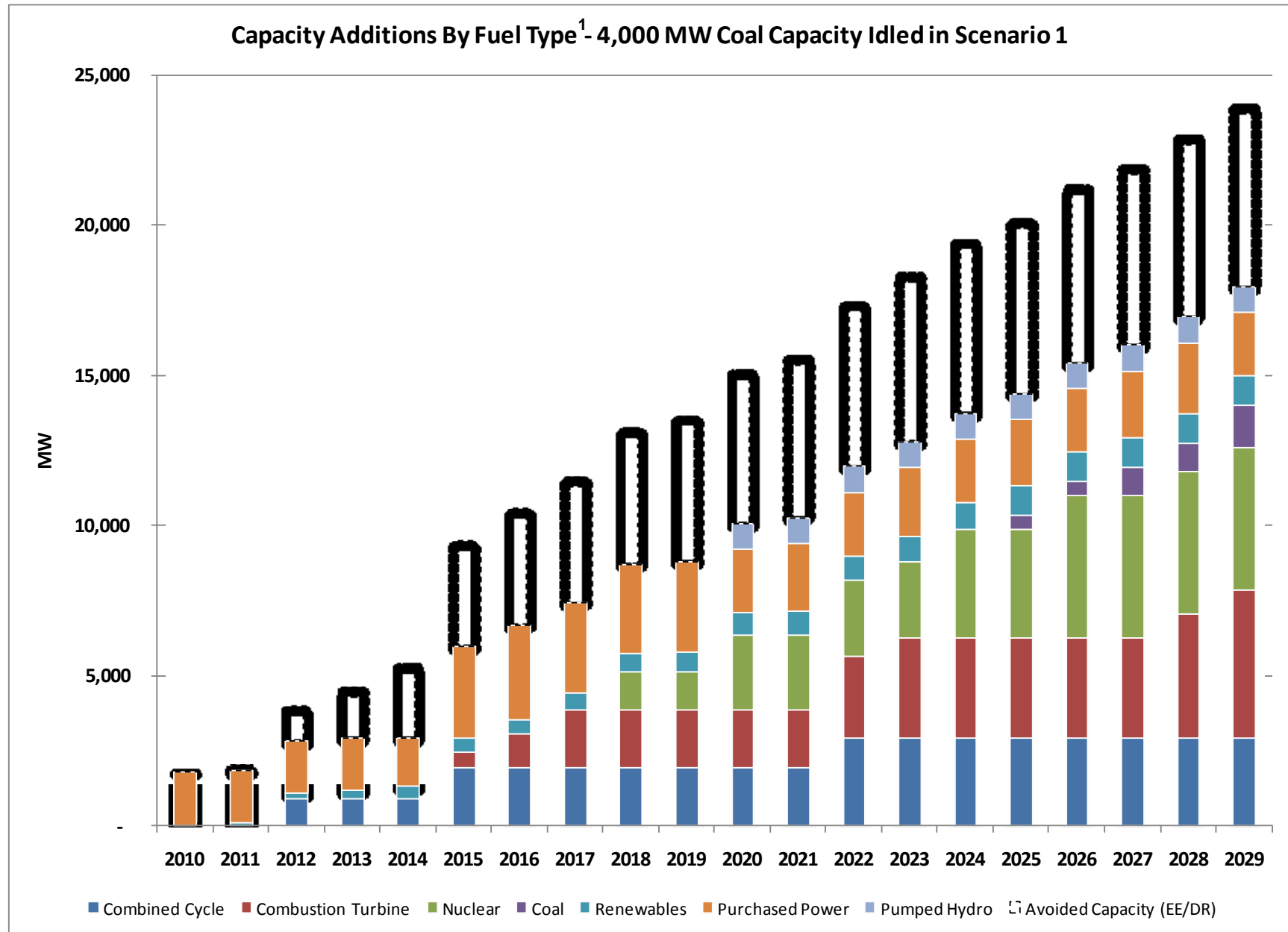
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



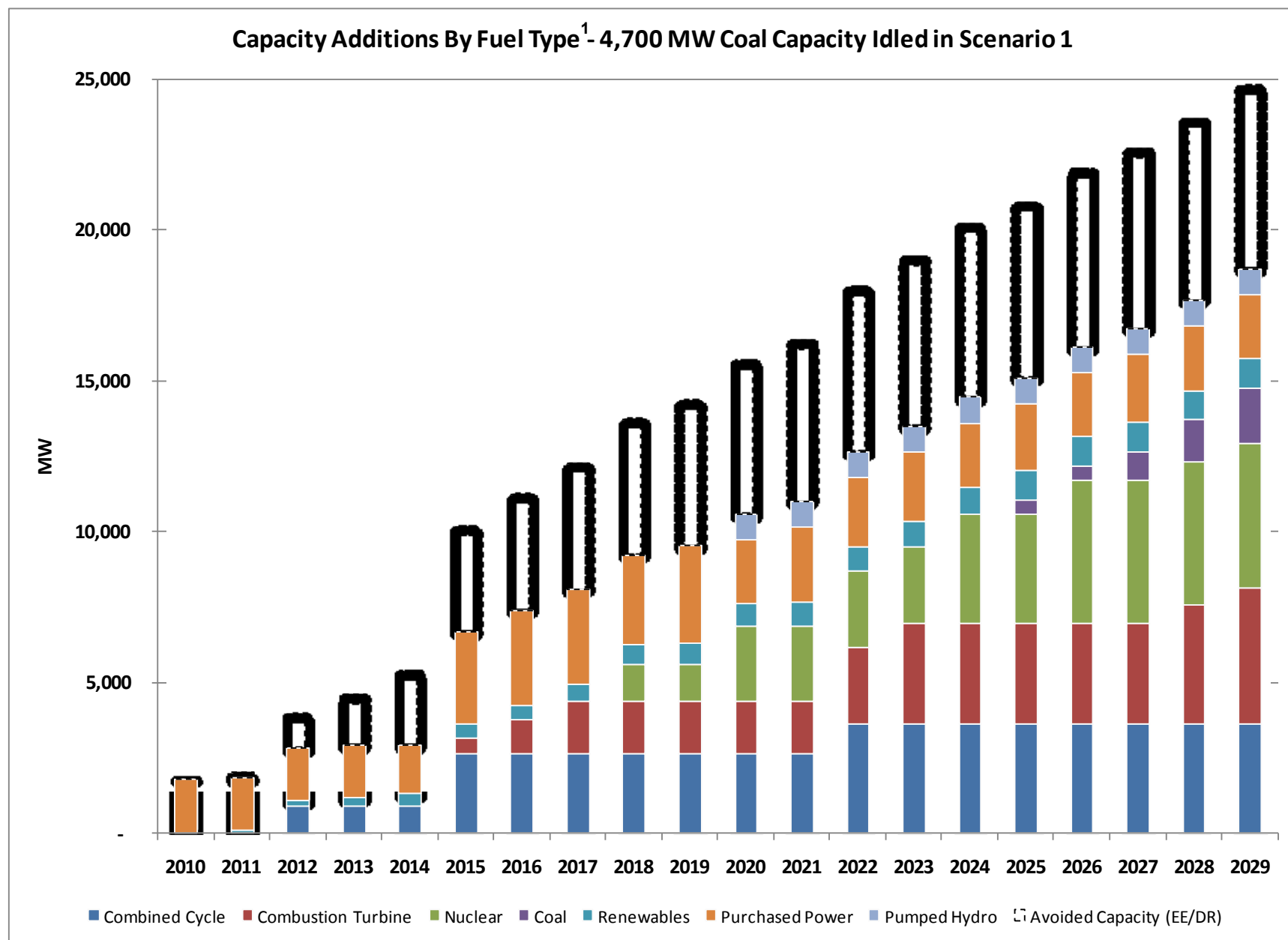
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



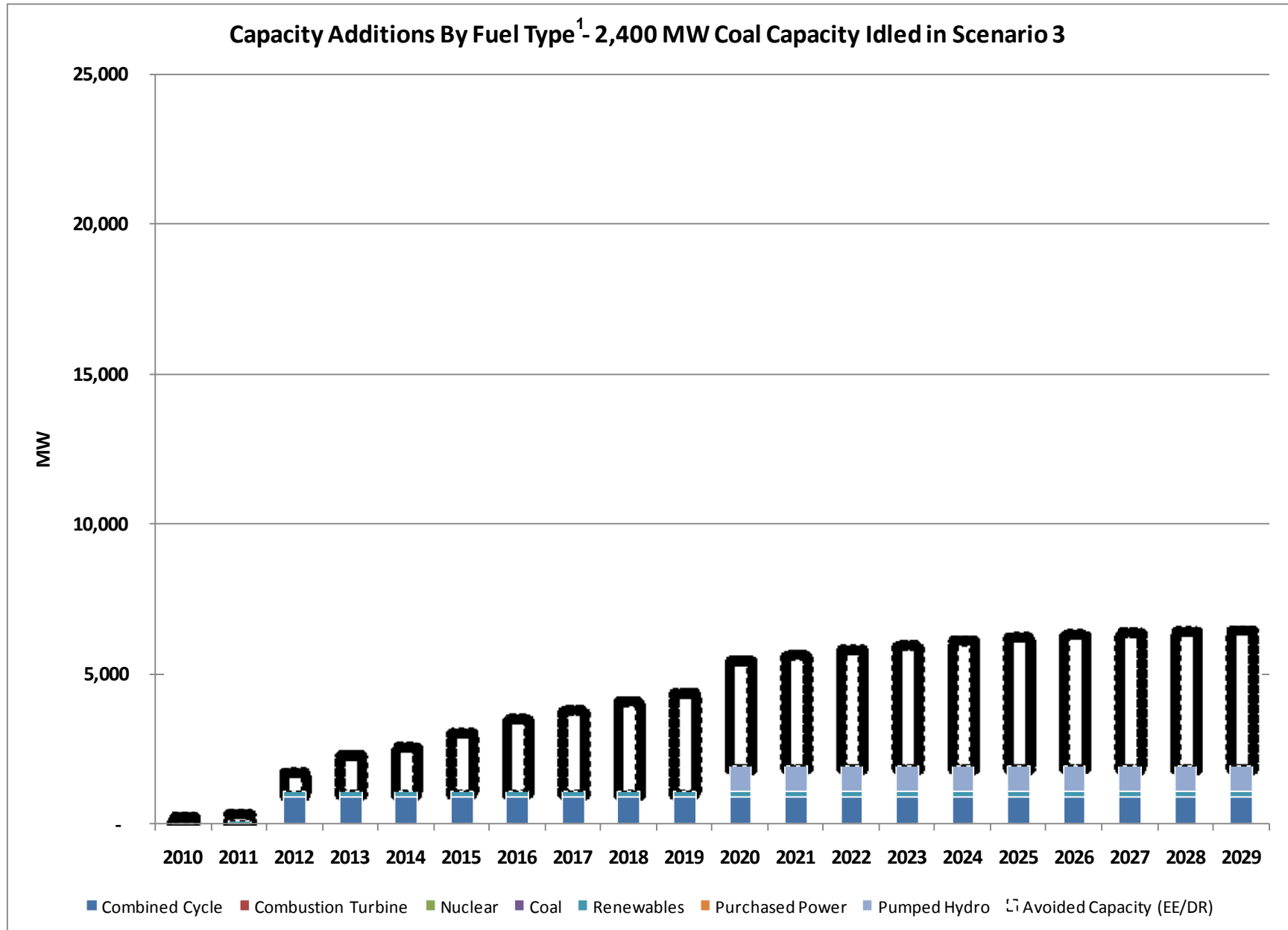
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



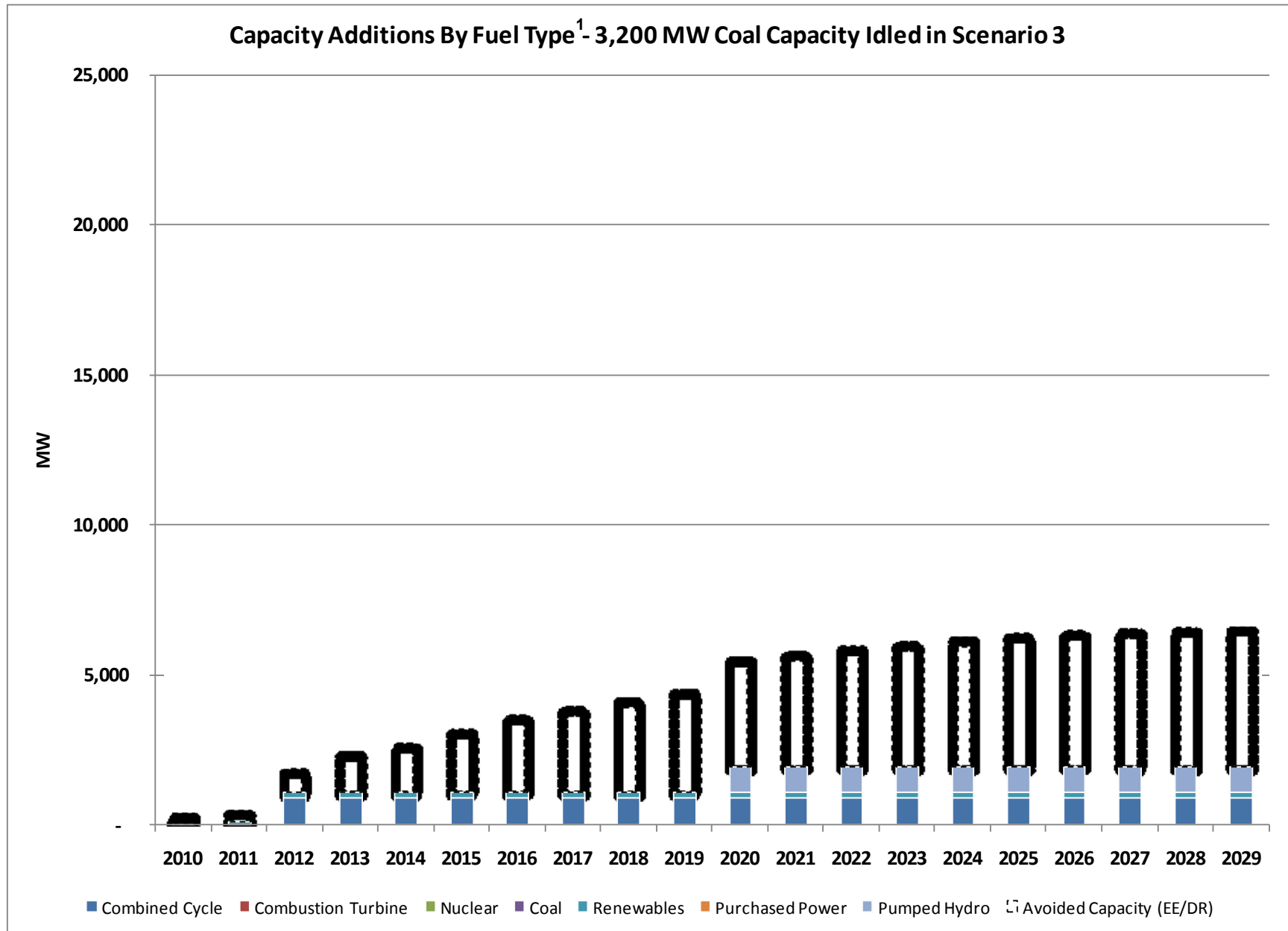
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

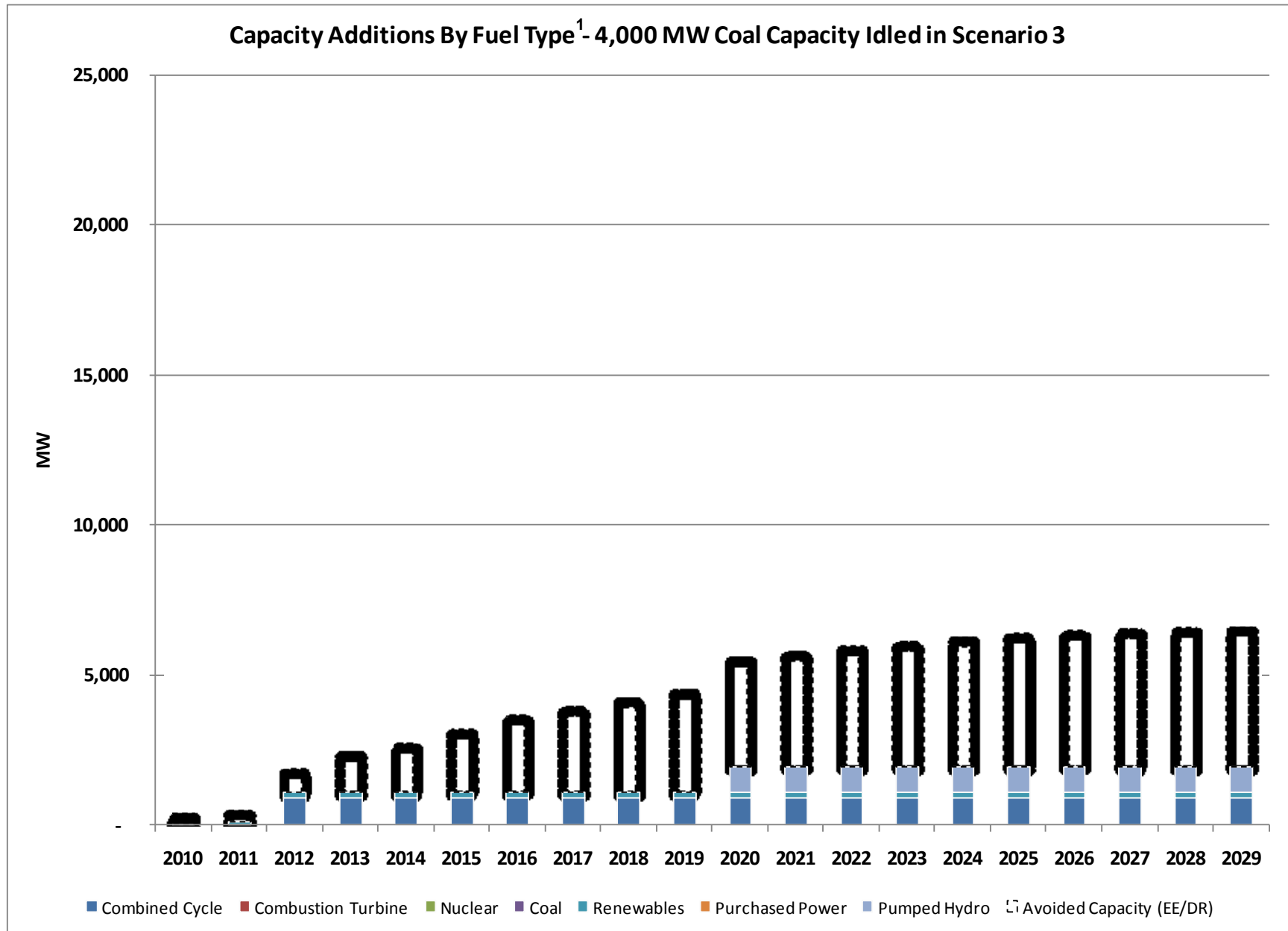
# Capacity Additions by Fuel Type (Cont'd)



1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

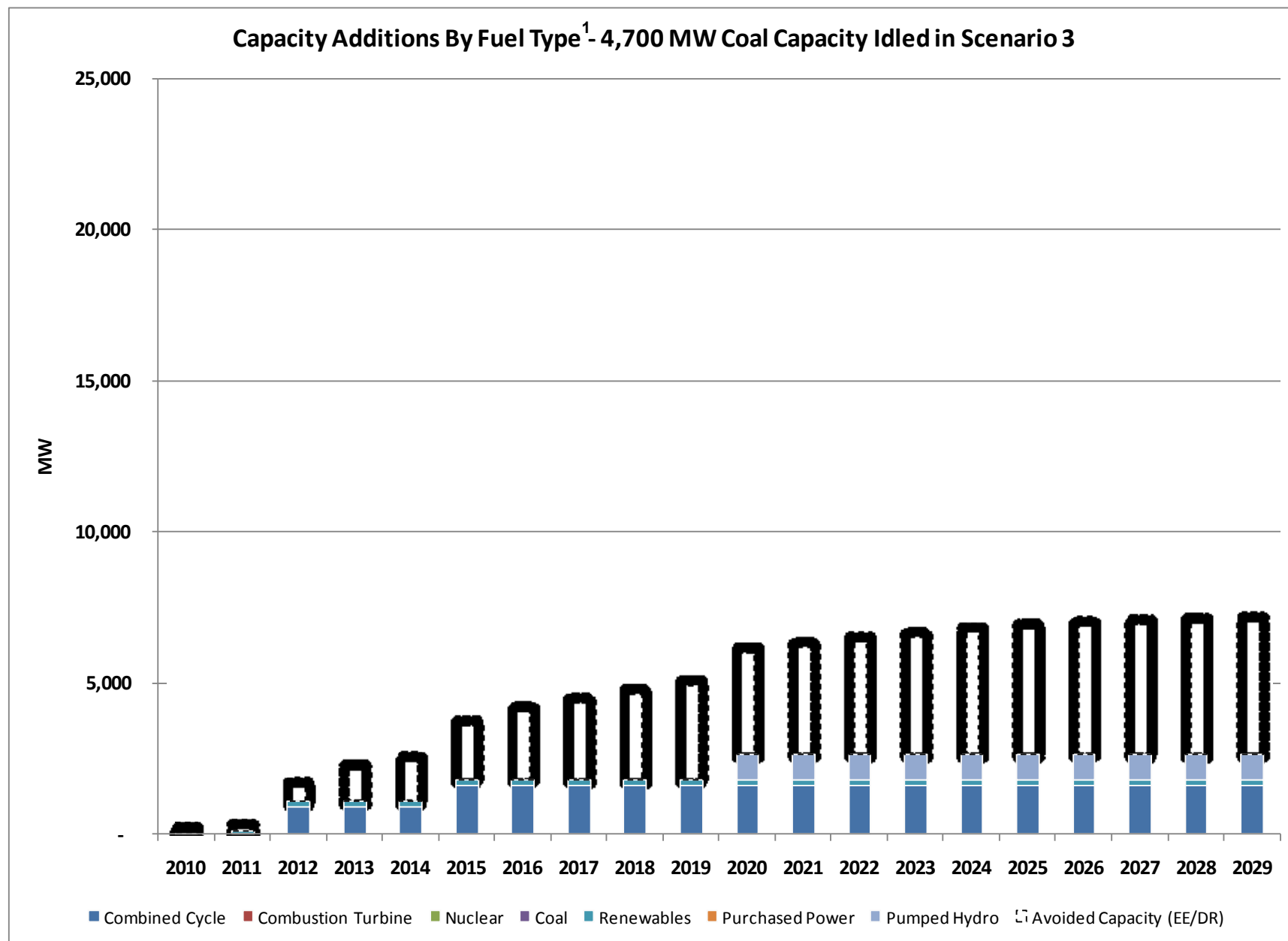


# Capacity Additions by Fuel Type (Cont'd)



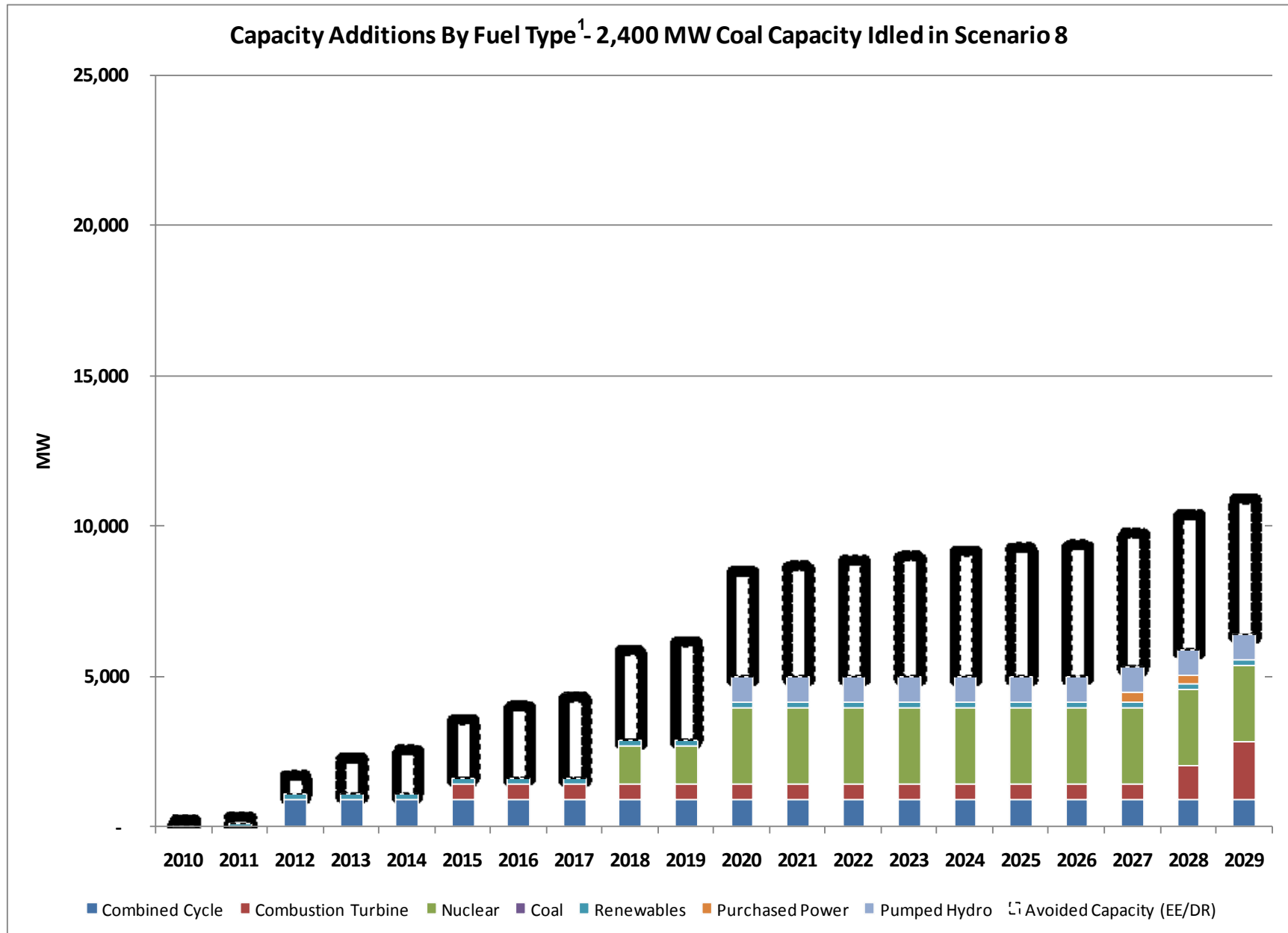
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



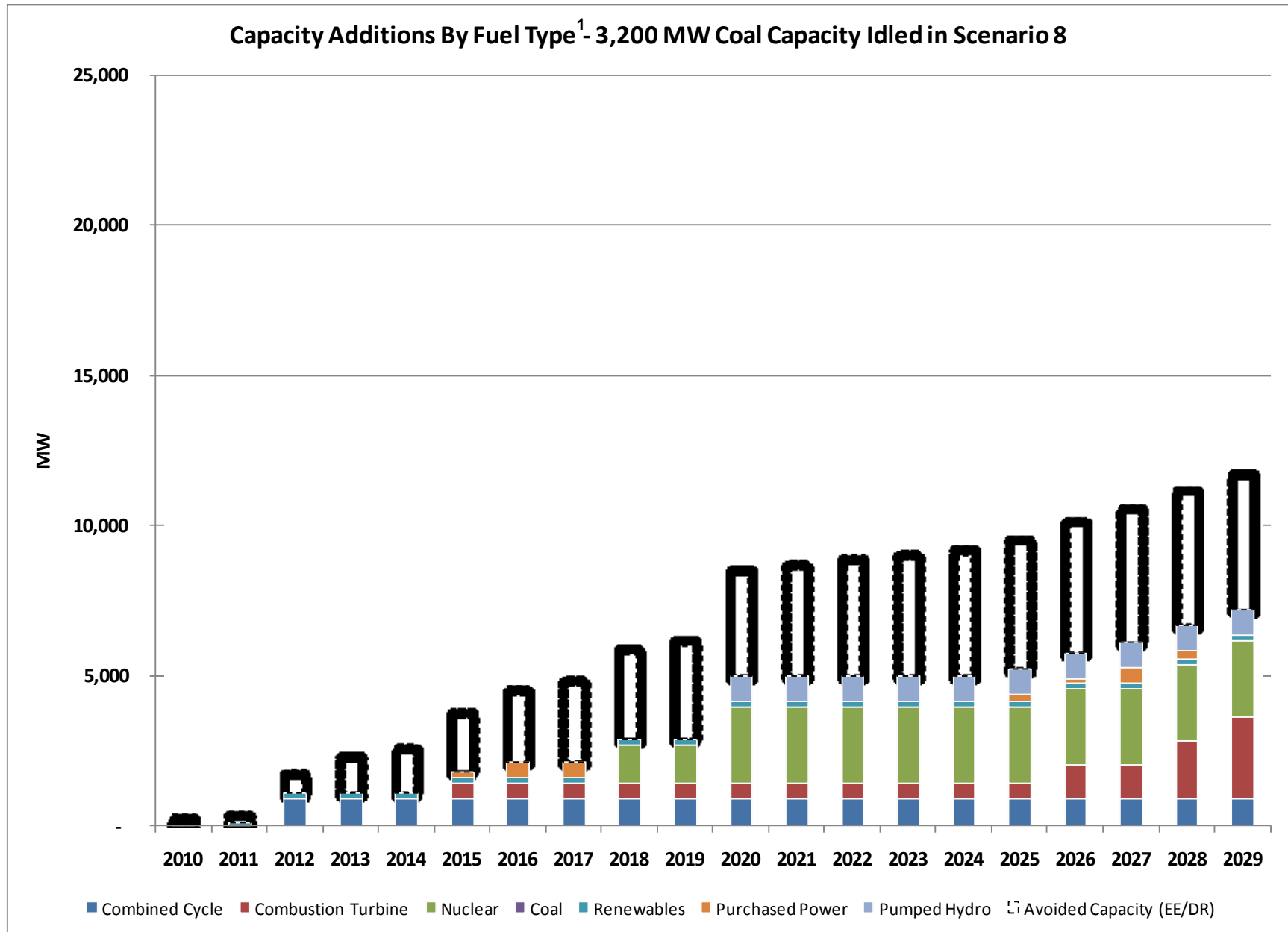
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



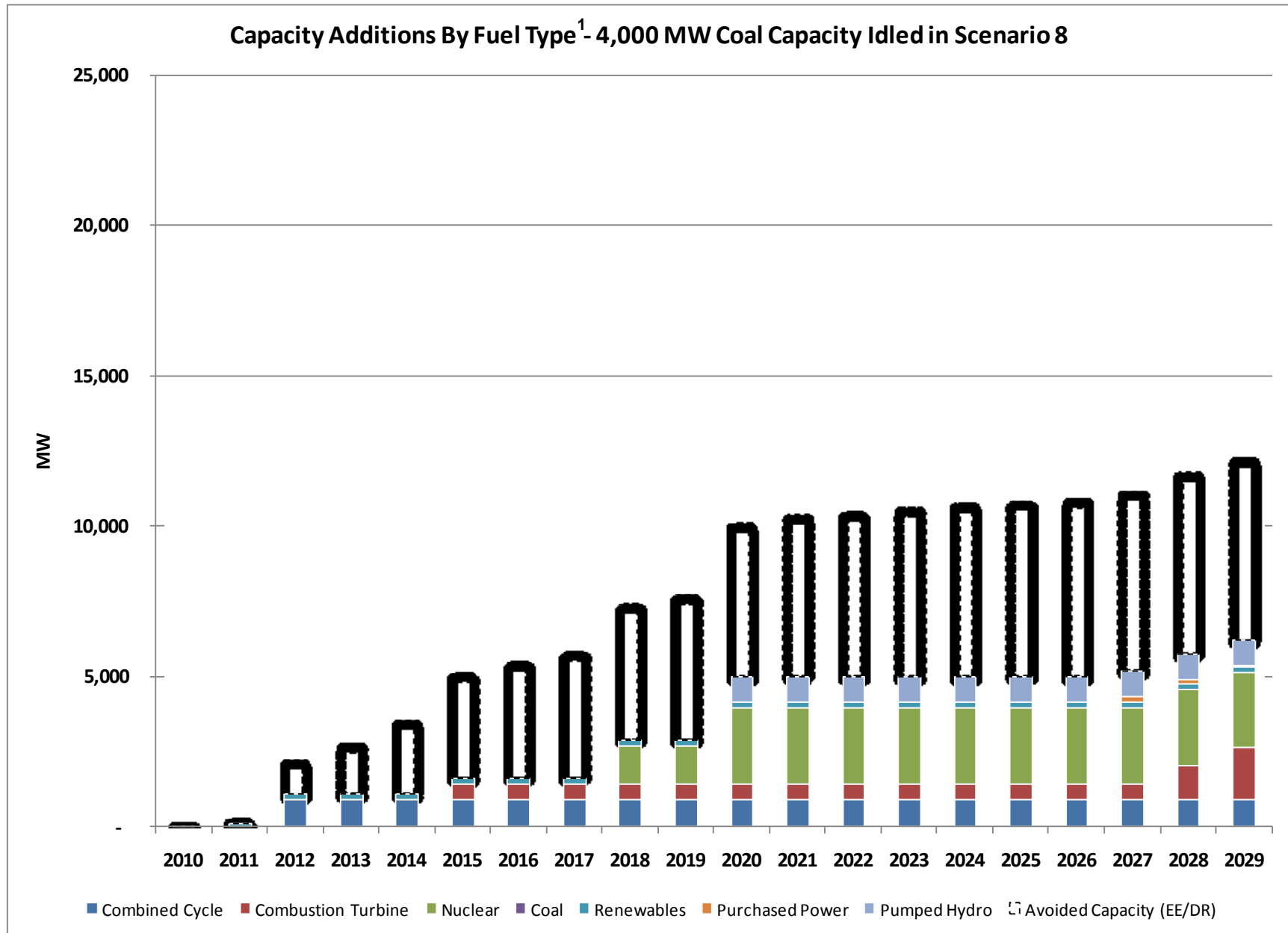
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



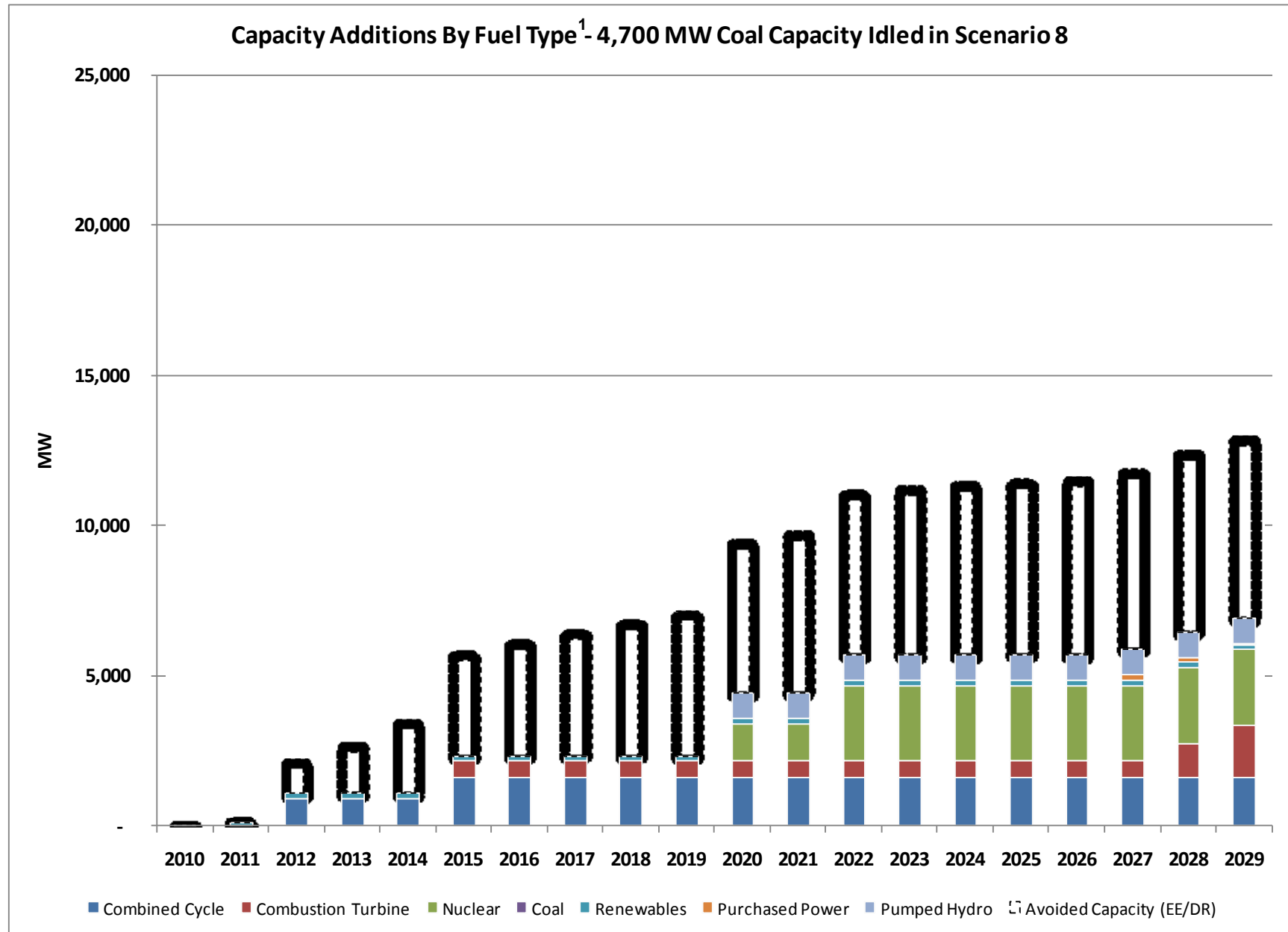
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



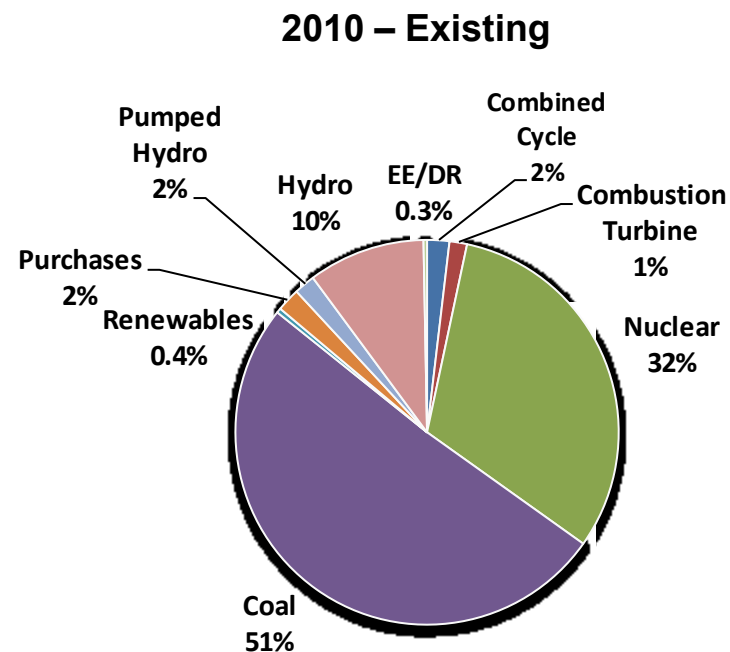
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

# Capacity Additions by Fuel Type (Cont'd)



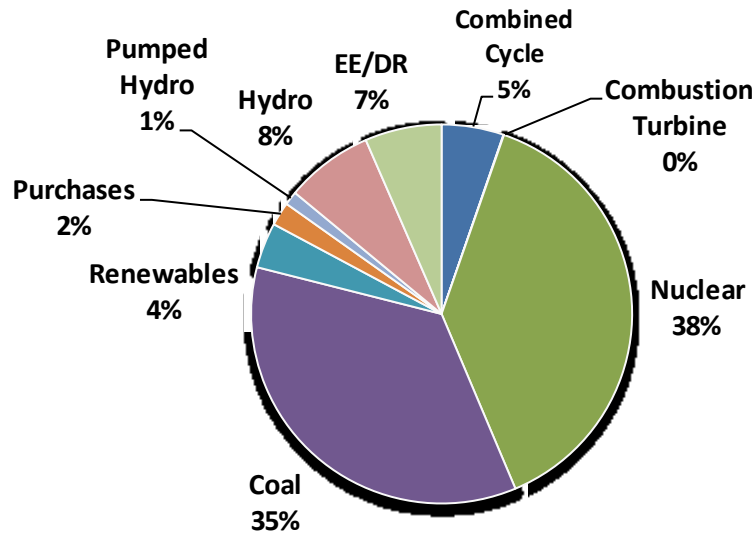
1 – Charts do not include the capacity contribution of Board approved projects (i.e., Watts Bar 2)

- ◆ Changes in resource mix will influence the total energy generated by fuel type
- ◆ Energy mix charts for all 12 portfolios are included on the following slides
- ◆ The change in energy mix is shown in pie charts with the percent contribution by fuel type in 2025
  - A chart for the existing system is shown to the lower right as a reference

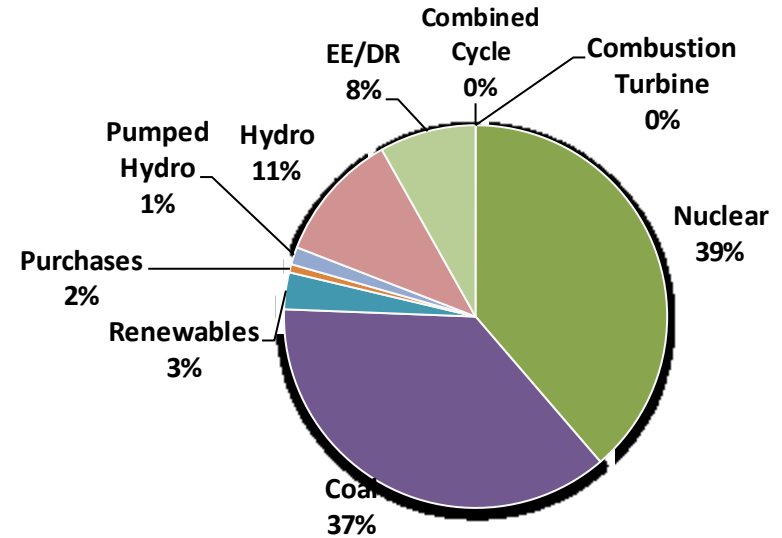


# Energy Mix by Fuel Type – 2,400 MW Idled Capacity in 2025

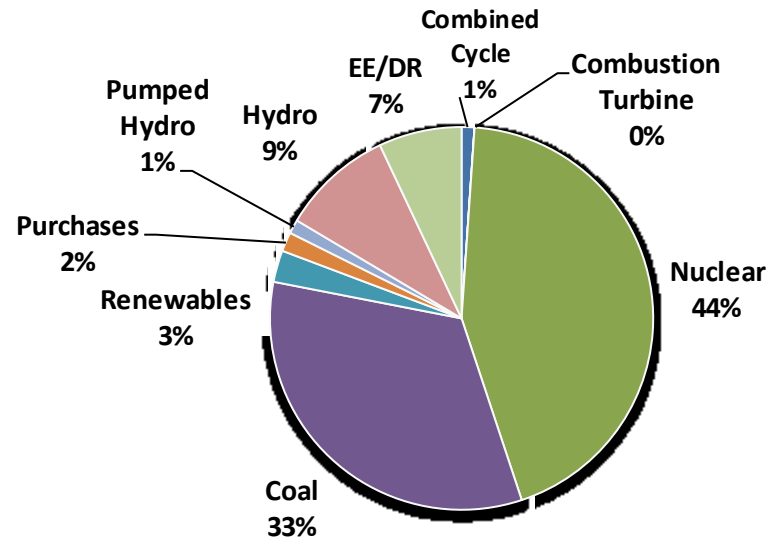
**Scenario 1<sup>1</sup>**



**Scenario 3<sup>2</sup>**



**Scenario 8<sup>3</sup>**

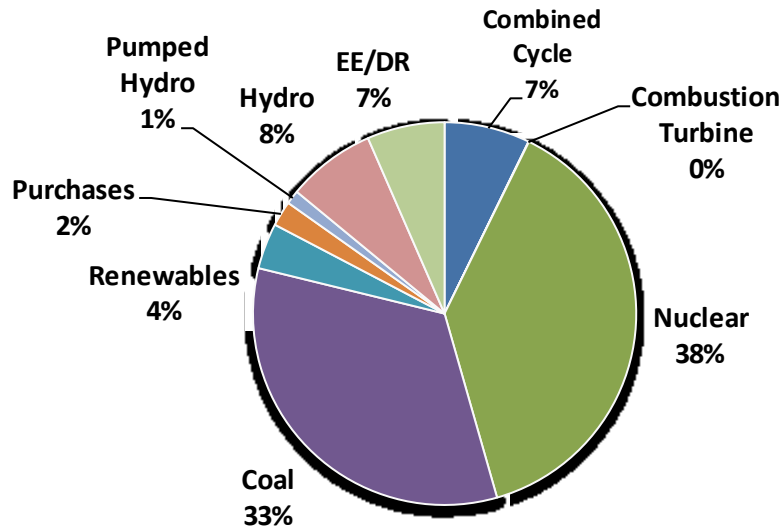


- 1 – Total energy ~246,000 GWh
- 2 – Total energy ~ 168,000 GWh
- 3 – Total energy ~195,000 GWh

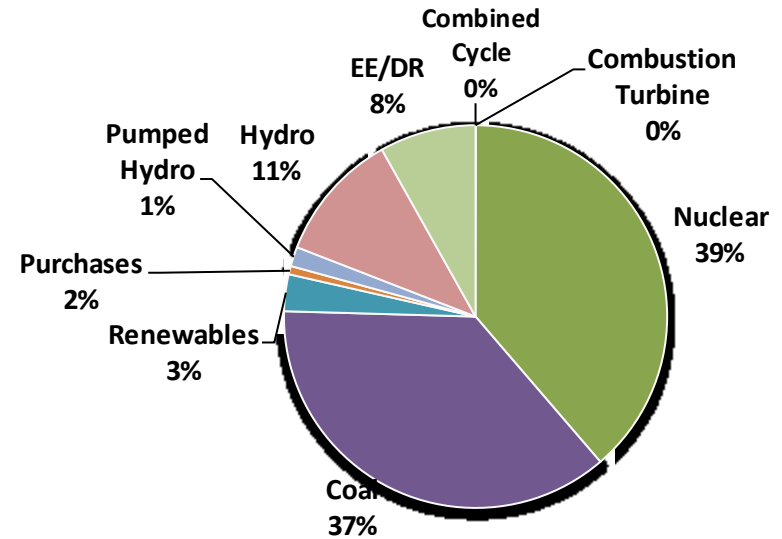


# Energy Mix by Fuel Type – 3,200 MW Idled Capacity in 2025

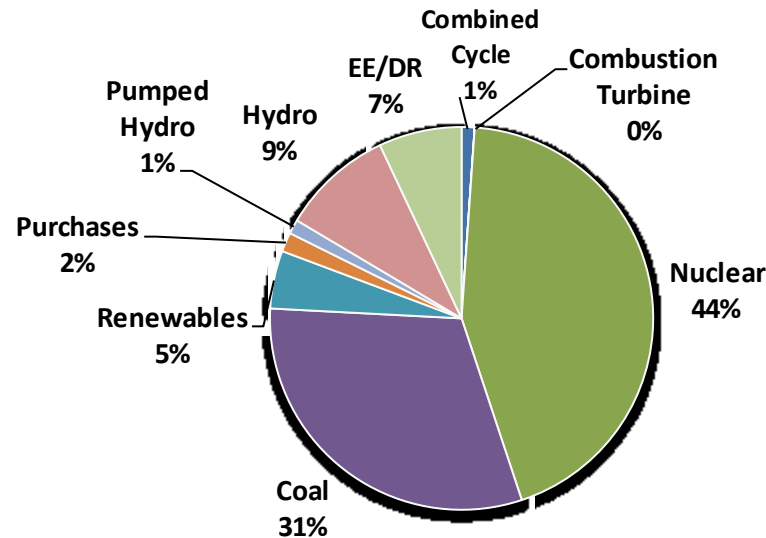
**Scenario 1<sup>1</sup>**



**Scenario 3<sup>2</sup>**



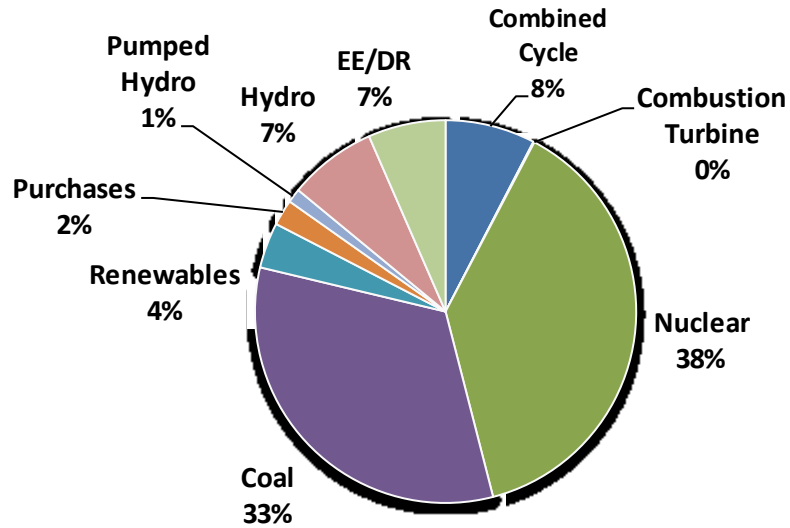
**Scenario 8<sup>3</sup>**



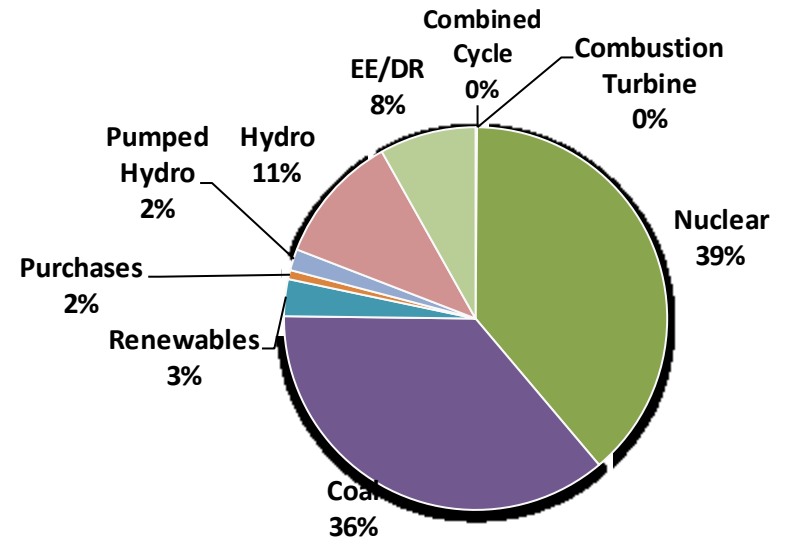
- 1 – Total energy ~246,000 GWh
- 2 – Total energy ~ 168,000 GWh
- 3 – Total energy ~195,000 GWh

# Energy Mix by Fuel Type – 4,000 MW Idled Capacity in 2025

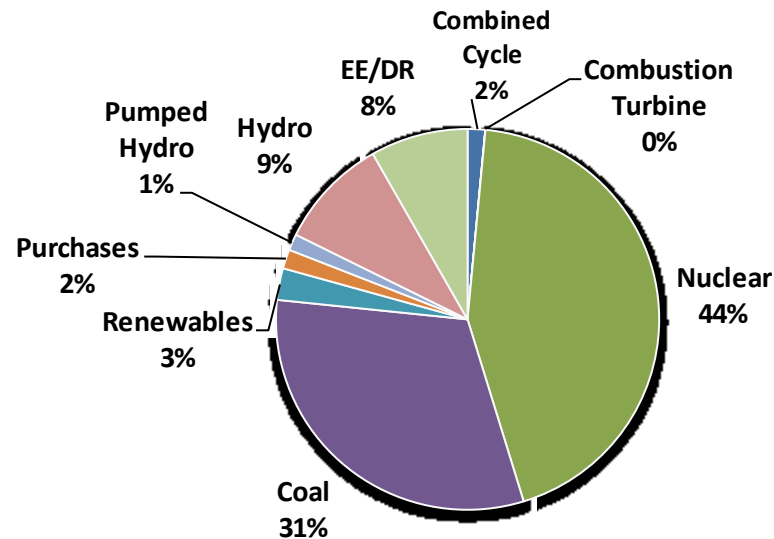
**Scenario 1<sup>1</sup>**



**Scenario 3<sup>2</sup>**



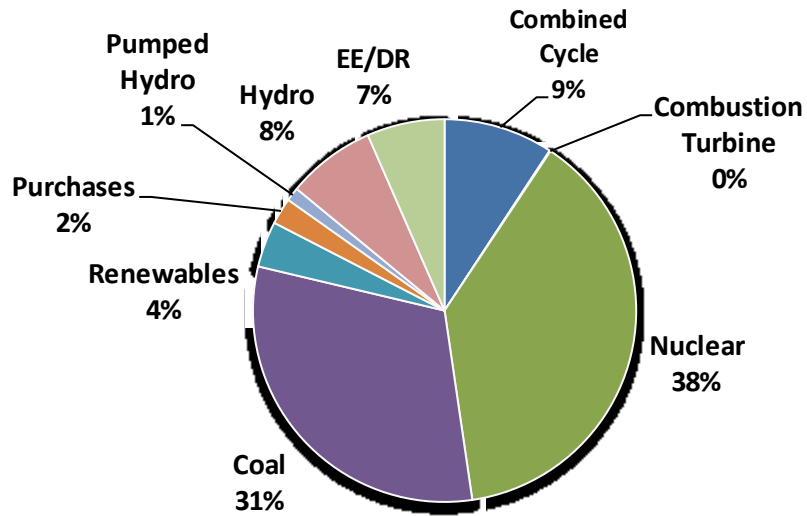
**Scenario 8<sup>3</sup>**



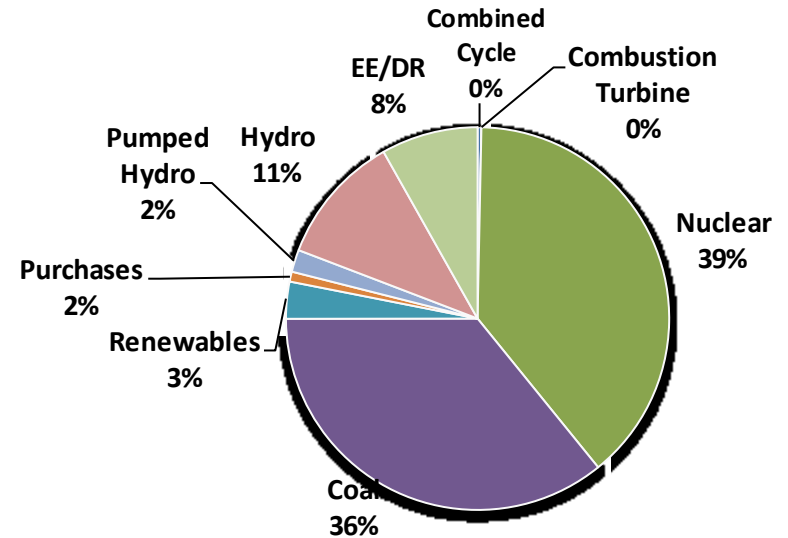
- 1 – Total energy ~246,000 GWh
- 2 – Total energy ~ 168,000 GWh
- 3 – Total energy ~195,000 GWh

# Energy Mix by Fuel Type – 4,700 MW Idled Capacity in 2025

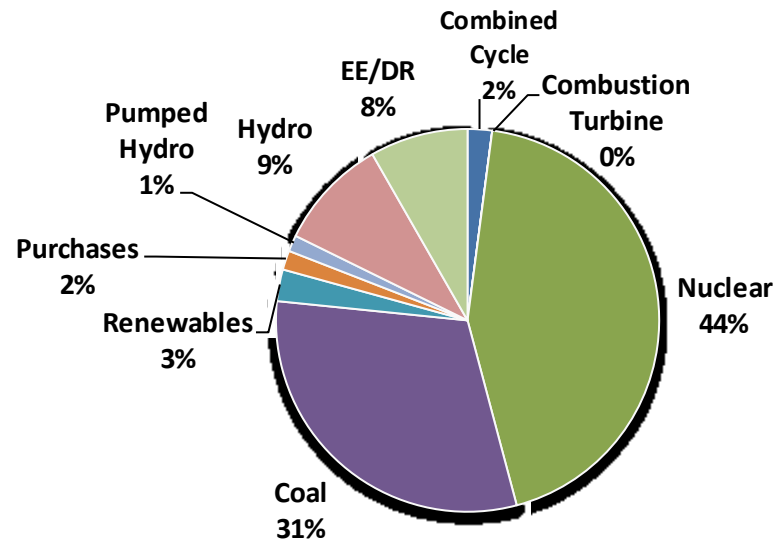
**Scenario 1<sup>1</sup>**



**Scenario 3<sup>2</sup>**

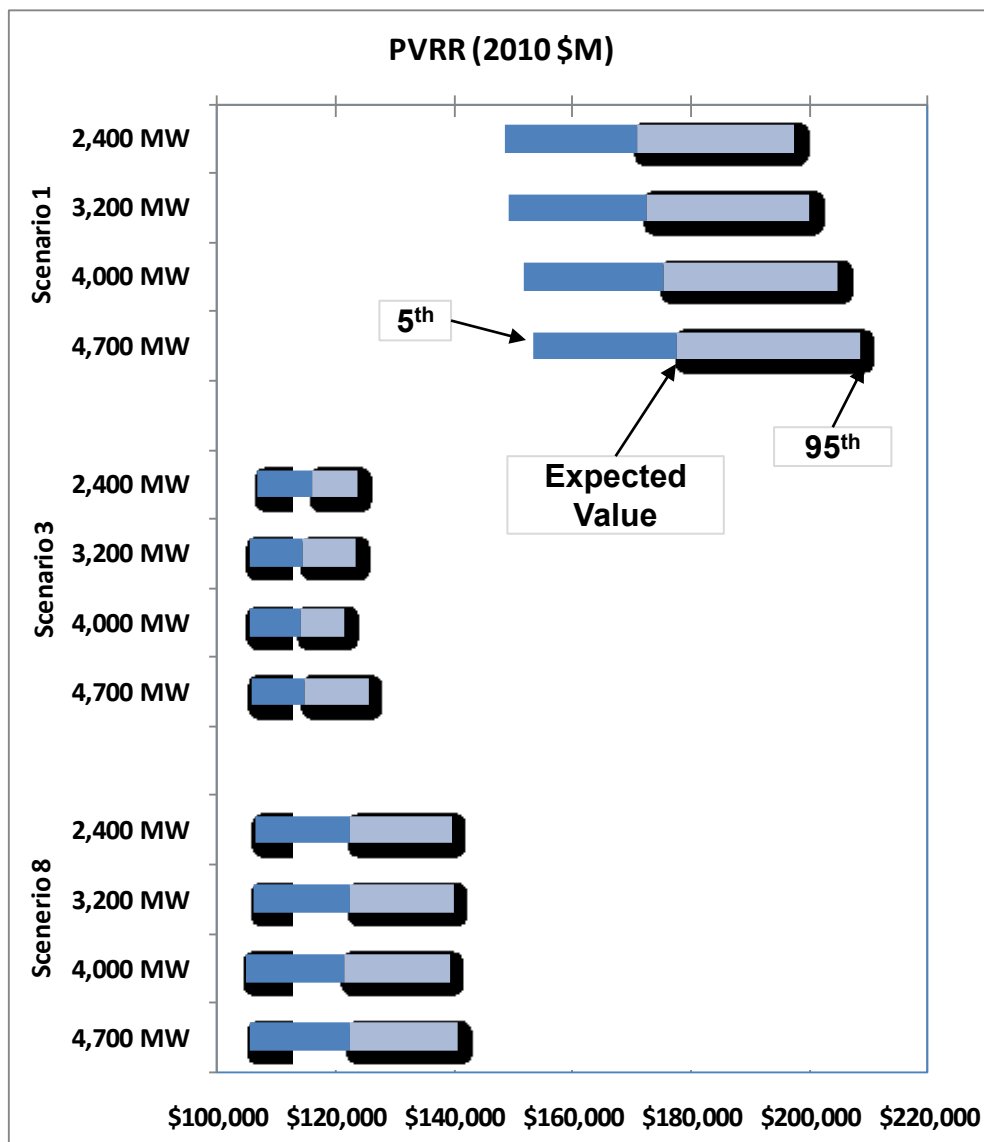


**Scenario 8<sup>3</sup>**



- 1 – Total energy ~246,000 GWh
- 2 – Total energy ~ 168,000 GWh
- 3 – Total energy ~195,000 GWh

- ◆ The Present Value of Revenue Requirement (PVRR) represents the total revenue required to cover TVA's costs, operating expenses, taxes, and interest paid on debt for the period
  - Results are shown for 2011-2028 in 2010 \$M
- ◆ The tornado diagram to the right illustrates the range of results from the 72 stochastic runs
  - The 5<sup>th</sup> percentile is the left edge of the bar
  - The expected value is at the color transition on the bar
  - The 95<sup>th</sup> percentile is the right edge of the bar
  - Wider bars illustrate increased variability in stochastic results
- ◆ Financial analysis is still in process



## The IRP Will

- Articulate a 20-year planning strategy
- Present a recommended planning strategy alternatives
- Describe guideline ranges for key components of the recommend planning strategy (e.g., EE/DR, fossil idling, etc.)
- Present illustrative portfolio(s) that shows potential asset additions by year
- Highlight key asset additions by showing a specific value within the guideline range in the illustrative portfolio
- Discuss other strategic considerations and non-quantified risk considerations
- Commit to beginning the next IRP no later than 2015

## The IRP Will Not

- Finalize specific asset decisions
- Be a substitute for the “fine tuning” of the annual planning and budgeting process
- Narrow the breadth of NEPA coverage established in the Draft IRP and EIS
- Make specific commitments for key components of the recommended planning strategy
- Commit to a specific 20-year capacity addition schedule
- Imply that any asset addition or in-service date shown in the illustrative portfolio represents a formal decision or is not subject to change
- Quantify all risks in the analysis or imply all decision criteria are within the IRP scope
- Be expected to provide NEPA coverage for the same duration as EV 2020



# Ongoing Analysis – Next Steps

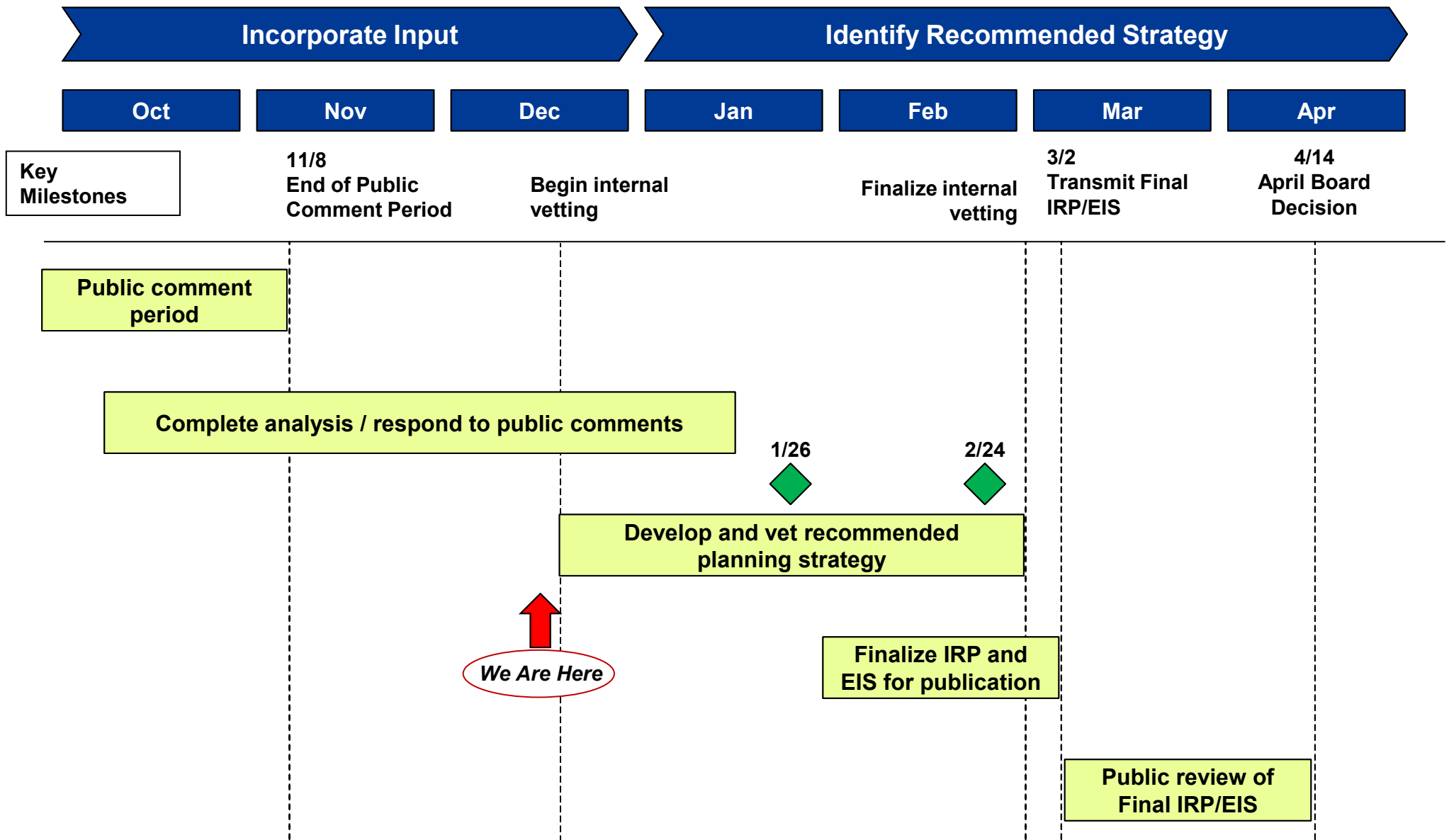
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- ◆ Finalize sensitivity cases and complete resource optimization modeling
- ◆ Complete and refine financial analysis
- ◆ Apply ranking metrics and identify key planning strategy attribute values
- ◆ Develop full scorecard with both ranking and strategic metrics for comparison with Draft IRP results
- ◆ Begin internal vetting with TVA leadership and developed recommended planning strategy

***Next Steps***

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# TVA High-Level IRP Project Schedule







# Future SRG Meetings

Two additional meetings are planned for the SRG

Meeting Type	Topics	Proposed Date
Working Session	<ul style="list-style-type: none"><li>◆ Review analysis results</li><li>◆ Discuss potential recommendations in Final IRP</li></ul>	January 26, 2011
Working Session	<ul style="list-style-type: none"><li>◆ Preview of Final IRP</li></ul>	February 24, 2011